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MODEL Airplane NEWS

SEPTEMBER 2005

PHOTO SPECTACULAR!

TOP GUN '05

THE WORLD'S BEST

FIGHTERS, BIPES, JETS & MORE

HOW TO
ELECTRIFY A GIANT BIPE

MASTER THE CROSSWIND p. 94

+6

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» Carl Goldberg **Matrix 40** » CAModel **Epsilon ARC**
» Skyshark R/C **Christen Eagle II** » RBC Kits **Skyray**
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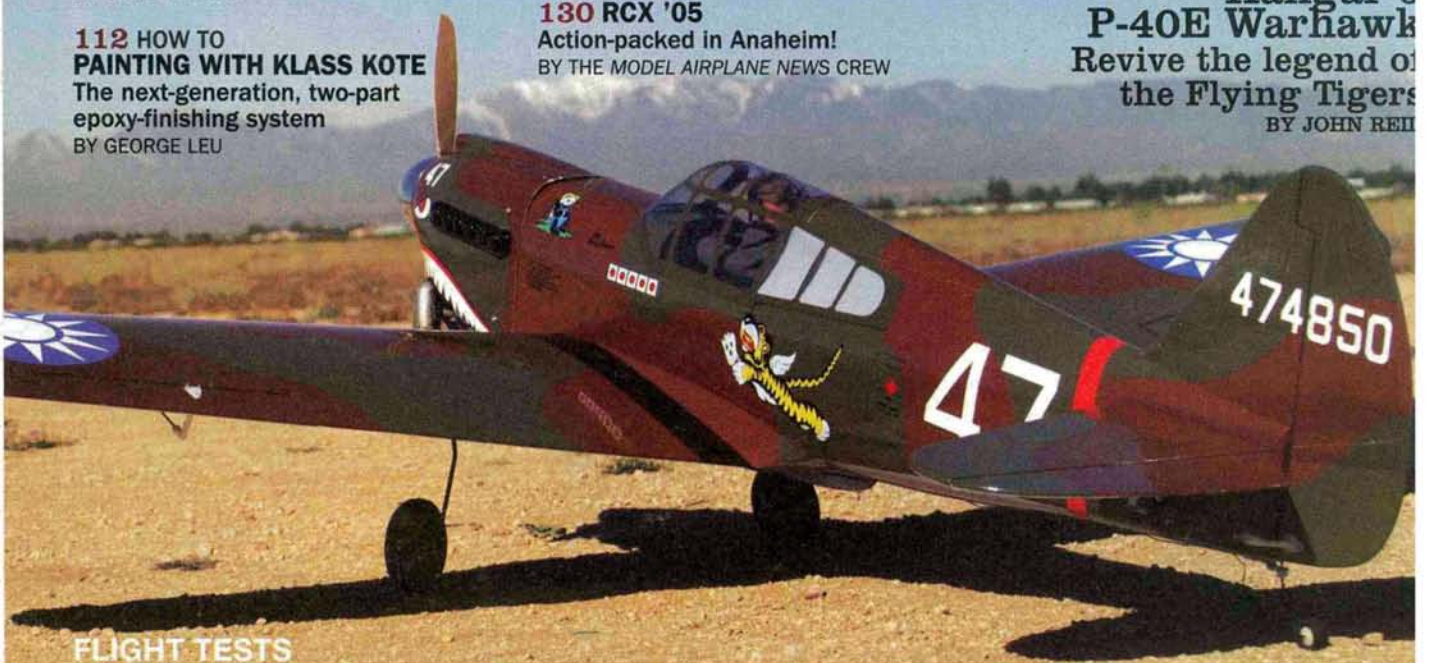

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ON THE COVER: at the 17th annual Top Gun Scale Invitational, Sung Ki and Henry Nguyen earned seventh place in Team with their beautif Grumman Panther. Don't miss senior tech editor Gerry Yarrish's coverag and photos, beginning on page 32. ON THIS PAGE: Hangar 9's P-4 Warhawk is reviewed by John Reid on page 48. (Photo by John Reid

BY DEBRA CLEGHORN

Top Guns of RC

EVERY SPRING, EXPERT MODEL CRAFTSMEN AND PILOTS FROM AROUND THE world gather for a weekend of scale camaraderie at the Top Gun Scale Invitational in southern Florida. Quite simply, the museum-quality model jets, fighters and civilian planes at this event are works of art, and you might expect their builders to want to keep these masterpieces safely on the ground. But you won't find any hangar queens; at Top Gun, how well a model plane matches its full-size counterpart in the air is just as important as its scale outline, realistic paint scheme and finish details. For an up-close look at 16 of the best model planes you've ever seen, check out our "Top Gun '05" coverage.

If you want to fly as well as a Top Gun pilot, you'll appreciate skilled flier (and Top Gun champion) Dave Patrick's advice on how to master crosswinds. By learning to take off and land in less than ideal conditions, you'll become a safer pilot as well as be able to enjoy more stick time on windy days.

In the workshop this month, our "Scale Techniques" columnist George Leu shares his insights on Klass Kote—a new paint system he recently tried. This two-part epoxy paint is available in a multitude of colors, primers and clearcoats and is compatible with the discontinued (and sorely missed!) K&B Hobbypoxy and Superpoxy paints. Check out George's how-to article for tips and techniques on working with this terrific new paint.

Big planes and electric power are a perfect match, as Greg Gimlick points out in his "Convert a ¼-scale aerobat to electric power" how-to this month. When Greg first saw the ¼-scale Cermark Pitts, he knew that it would be an ideal candidate for a glow-to-electric conversion; see his easy transformation on page 118.

Earlier this year, Futaba created quite a buzz when it introduced its new flagship radio, the 14MZ. With limitless programming options and features, this high-end radio is perfect for pro pilots. But what about the sport fliers out there? The engineers at Futaba haven't forgotten them; enter the new Futaba 6EXA, a computer radio that's easy to use and won't break the bank. For the inside scoop on Futaba's latest RC system, check out our review on page 89.

We have a nice surprise for readers who are partial to smaller RC models: a downloadable plan of Gerard Jumelin's Variante 50, a true flying wing with a wingspan of only 50 centimeters. This all-foam plane is an easy build and offers exciting indoor and outdoor performance; check it out on page 126.

Safe landings.

Debra Cleghorn

Executive Editor

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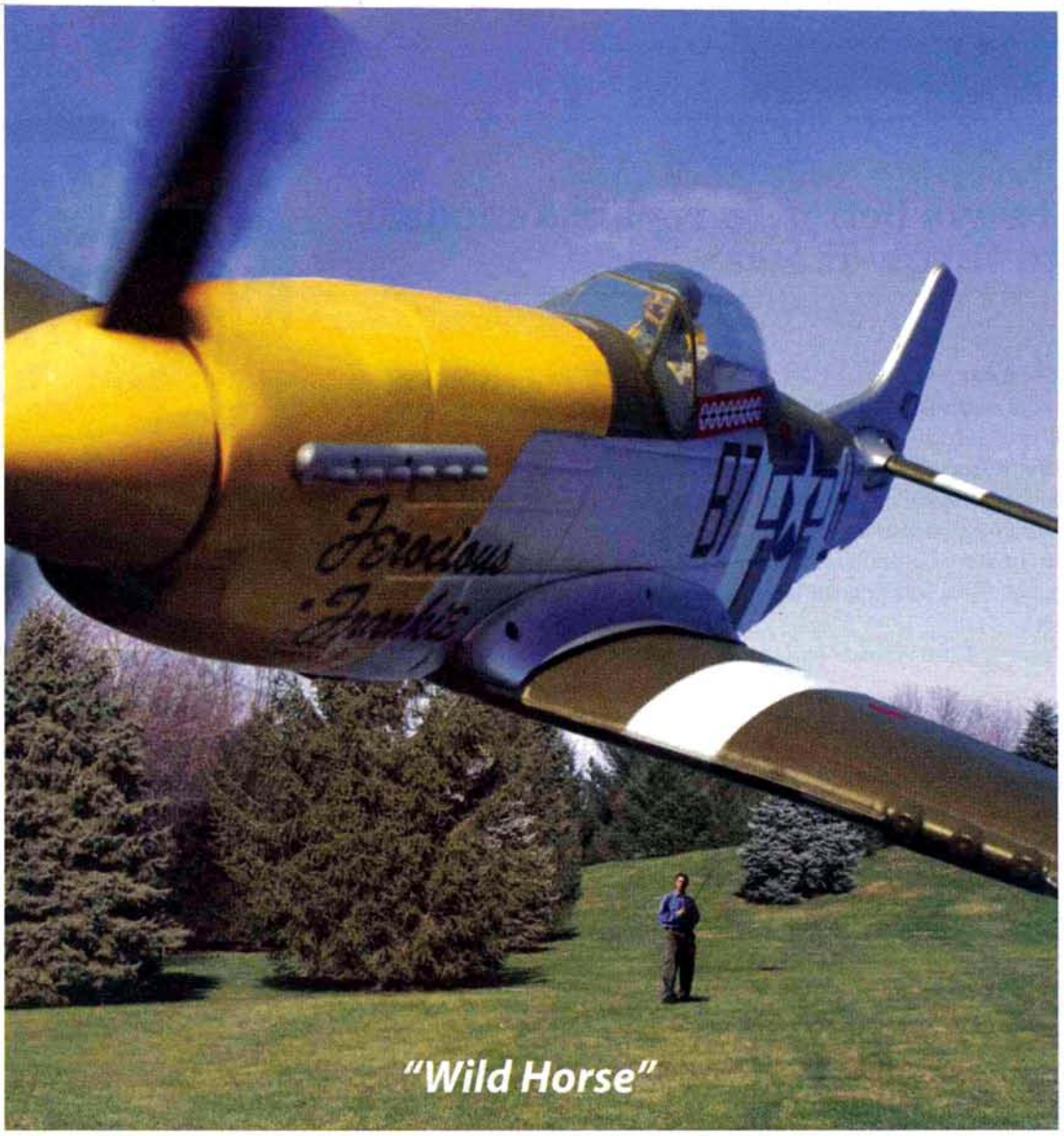

The most successful fighter of WWII, the P-51D Mustang still thrills thousands today in air shows and air races around the world. Now you can experience Mustang thrills on a smaller scale with this fully aerobatic Charge-and-Fly™ reproduction from ParkZone.™ And getting it airborne is about as simple as it gets. Just attach the wing and tail, connect the battery to the charger and in as little as 40 minutes, you're flying. Once in the air, you can choose between two flight modes—"A" for mild and "B" for wild.

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It is always better to repair a model than to throw it away.

MATT CHAPMAN'S CAP 580

Just a quick note to thank you for a great review on the new CAP 580 aerobatic giant featured in the August 2005 issue! One question, though: is there enough room inside it for a smoke system and a smoke-fluid tank? It would be a shame not to have a smoke trail while wringing out that beautiful model.

RALPH WHITMAN [EMAIL]

Ralph, thanks for writing. As a matter of fact, with that big main fuselage hatch and its simple fuselage structure, the CAP 580 offers nearly unrestricted access to all parts of its interior. You could easily drop an 18- or 20-ounce smoke-fluid tank, all the associated hardware and a pump in there, and you'd still have room to spare. Go for it! Smoke on! GY

AIRPLANE REPAIRS

I need to fix an airplane that I just flew into a tree, and I hope you can give me some insight into what I need to do. I flew the airplane into a tree after its engine died, and I was gliding it down. The fuselage (behind the wing) broke off. I think I should use a long piece of plywood from the wing all the way back for strength. The airplane is an old Carl Goldberg Falcon 56, and I'd like to hang onto it because the wing, the new engine and everything else is intact.

VIDUR SOOD, SAN MATEO, CA

Vidur, yes; it is always better to repair a model than to throw it away. You can't replace a model for the cost of the repair materials. Here's our advice: strip away the covering, then gather all the damaged parts—even the very smallest pieces. Glue all the small parts back together so they'll more easily fit back into place. From the inside, bridge the main break with pieces of ⅛-inch lite-ply. Cut them to size, and fit them into place so they extend about 3 inches on either side of the fracture. Glue them to the fuselage tail part, and then slip them into the front of the fuselage. You

may have to cut away part of the bulkheads to make room for these reinforcements. They should lie flat against the inside of the fuselage sides and bottom. Use 30-minute epoxy so you'll have time to move things into the proper positions. Make sure that you measure the tail surfaces for alignment so you do not reassemble the model with a bend in it! Replace any parts that you cut away, and sand the model smooth. Use filler to fill in any missing pieces or large cracks, and sand smooth again. Recover the model, and you'll be good to go. Hope this helps! GY

MORE WARBIRDS, PLEASE!

The best article ever published in any of the modeling magazines is your "Top 10 Scale Warbird ARFs" published in the October 2004 issue. I have read and

referred to it many, many times; more important, I purchased a plane from one of the companies listed and will purchase another one soon. The lead-in, "Inside every red-blooded modeler lurks the soul of a fighter pilot ..." says something that should be heeded when you plan articles for future issues. Please consider an annual repeat of that great warbird article because it contained so much vital information about them, especially the "Flight Performance" ratings, which were really a big help in determining which one to buy. How about a follow-up article about wooden kit warbirds?

PATRICK "WILL" WILLIAMS [EMAIL]

The October '04 warbirds guide was indeed a very popular article, and we just completed a similar one for electric-powered warbirds in the September 2005 issue of our sister publication, Backyard Flyer. *As time goes by, you can count on seeing more warbird-related articles because we love doing them!* GY

WHAT ARE MICRO BALLOONS?

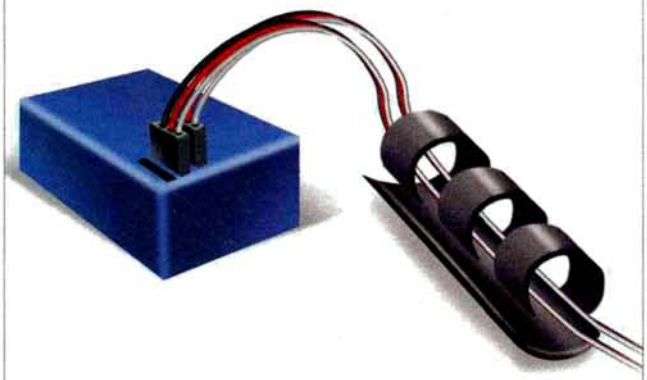
I am building a model airplane, and the instructions say to add "micro balloons" to the epoxy to make it stick better to the formed plastic parts. What are these? I would have used thick CA adhesive for this, but I don't want to mess anything up.

RANDY JOHNSON [EMAIL]

Randy, micro balloons have been around for a long time. They are mixed into the epoxy or polyester resin (up to 50 percent) as a thickener to help prevent the adhesive from running. Made of finely ground plastic, wood fibers, or microscopic glass beads, micro balloons turn epoxy into a very sticky pudding. You can use a mixing stick to trowel the thickened adhesive into place, and it will stay put. When fully cured, micro balloons and resin can also be sanded, ground and carved to shape to make fillets. GY

WRITE TO US! WE WELCOME YOUR COMMENTS AND SUGGESTIONS. LETTERS SHOULD BE ADDRESSED TO "AIRWAVES," *MODEL AIRPLANE NEWS*, 100 EAST RIDGE, RIDGEFIELD, CT 06877-4606 USA; EMAIL MAN@AIRAGE.COM. LETTERS MAY BE EDITED FOR CLARITY AND BREVITY. WE REGRET THAT, OWING TO THE TREMENDOUS NUMBERS OF LETTERS WE RECEIVE, WE CANNOT RESPOND TO EVERY ONE.

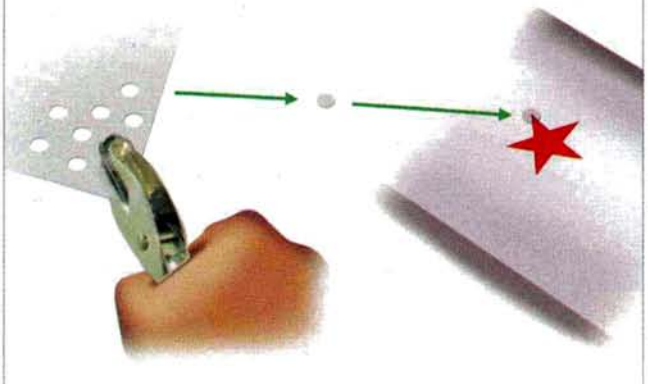
ILLUSTRATIONS BY RICHARD THOMPSON



Neatness counts

Modelers often struggle when securing the numerous wires that run through their models. Instead of using nylon zip-ties that have to be cut and replaced when you need to do maintenance, use the plastic bindings that are used on small booklets. You can buy them at a stationery store. Simply cut them to the length you need and glue them into the fuselage. You'll now easily be able to add or remove wires. The bindings also work great on helicopters (instead of spiral wrap).

Karl Byman, Longview, WA



Get the point

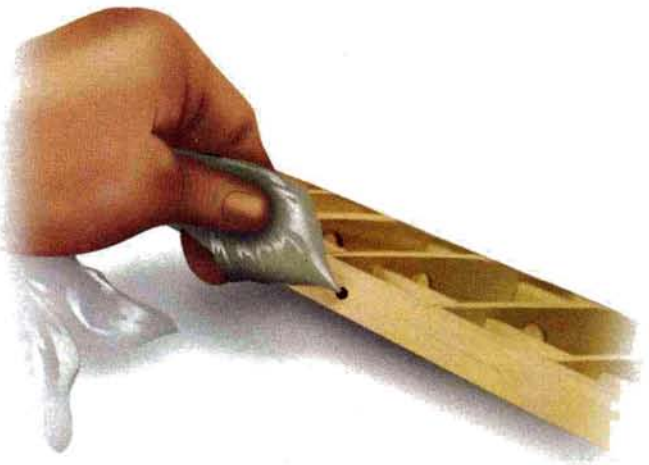
You've spent hours cutting stars and ironing them into place on your latest model, and it looks great—until the first time you wipe it down after a flight. You notice that the rag has started to pull up the points of the stars. To prevent this from happening, get a roll of clear MonoKote, use a paper punch to make a bunch of holes in the MonoKote, and gather up the little dots that you'd usually throw away. Now iron the clear dots over the star's points and the surrounding areas to permanently seal the points down.

Matt Chapman, Kennett Square, PA

Fill 'er up

Robart Hinge Points are excellent, but putting the proper amount of glue into the holes for them can be a messy task. To resolve this, put a large glob of slow-curing epoxy into a corner of a plastic sandwich bag. Cut off the tip of the corner, and you'll be able to easily and accurately squeeze the glue into the holes.

Damien Glassy, Flagstaff, AZ



Throttle safety

At one time or another, most pilots have accidentally bumped the throttle stick during preflight or pit operations. The sudden opening of the throttle can be unnerving. A simple way to prevent this from happening is to form a small piece of wire such as a paper clip into a double loop and secure it to the back of the transmitter case using one of the screws that holds the case halves together. Anchor a small rubber band to the wire loop, and run it over the throttle stick to hold it in the idle position. When you're ready for flight, slip the rubber band off the stick and just let it hang.

Woody Woodworth, Gainesville, VA

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch and a brief description to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SUBMISSION. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

PROJECT OF THE MONTH

*Mister Mulligan

Barry McLean
Whittier, CA

This handsome model took six months to hand-cut and construct. A Zenoah G-45 engine with CH electronic ignition powers this ¼-scale Mister Mulligan along with a Futaba radio system. Barry says that it flies "... about three times faster than a Piper Cub." It is covered with white 21st Century fabric that looks as good as hand-rubbed paint. Other features include a 13.5-inch fiberglass cowl with rocker arm bumps and Williams Bros. Wright J5 ¼-scale cylinders to make the dummy radial engine.

>Hangar 9 T-34A Mentor

Bill "Mad Dog" Miller
Eagle, ID

Bill powers his terrific-looking model with an O.S. FX .40 engine and Hobbico retracts. He changed his kit to an "A" model by adding a fillet to the bottom of the Mentor's rudder. The color scheme was inspired by the civilian-formation flight team called "Lima Lima" based out of Naper Aero Club field near Naperville, IL. Bill says that his plane is "... a great flyer—smooth and predictable."

>P-51 Mustang

Dan & Jim Loveless
Bountiful, UT

If you think that these ⅐-scale models look familiar, you're right! Both were patterned after Alden Rigby's plane that was featured in the February 2005 issue of our sister publication, *Flight Journal*. Dan scratch-built the "Eleen and Jerry" plane over the course of 20 years! He powers it with an O.S. .91 engine, and it's covered with 21st Century paint. With some help from his father Jim, Dan also rebuilt the "Moonbeam McSwine" Top Flite kit, powering the P-51 with a SuperTigre .91 engine, a Futaba 8UAF radio and Spring Air Products retracts. It is covered with chrome MonoKote. Great job, guys!

>Mister Rearwin
William Mol
Austin, TX

When William discovered that the wings of his nonfunctioning Mister Mulligan fit perfectly on the fuselage of his Rearwin Speedster, he created the Mister Rearwin. Other interesting surgeries included using the windshield, wheel pants and strut mounts from a crashed Super Cub. William refers to his contraption as a "... true composite flying machine that flies great!" He powers his 19-pound bird with a G-45 gas engine and a 20x10 prop.

>Pitts S2B
Meril Davidson
Joplin, IN

Scratch-built from Andy Sheber plans, this Pitts has an 80-inch wingspan and weighs 30 pounds. Meril powers his S2B with a 3W-100 twin engine, a 26x10 3W prop, a JR 8103 radio, a PCM receiver and two 1400mAh batteries. He added aluminum panels with 273 button-head screws, cabane struts welded from automotive-steel brake lines and a Sullivan Skywriter smoke system, and he covered it with Super Coverite and Krylon.

>Aquastar Seaplane "Dragonfly"
Dale Nash
Moorpark, CA

With a wingspan of 70 inches and a 59-inch-long fuselage, this balsa and fiberglass flyer weighs only 12 pounds. Dale powers his Seaplane with an O.S. .91 FX engine, a 14x7 Master Airscrew prop and a Futaba radio. The plane's sleek finish is a combination of paint, homemade decals, a clear Klass Kote top coat and MonoKote wings. He modified his kit by installing a much larger engine and homemade fiberglass wing floats. Dale says, "The Dragonfly is very stable; it's one of my favorite floatplanes."

>Sopwith Camel
Irwin Weisbrot
Norwalk, CT

Powered by a Speed 280 motor, a GWS micro-receiver, a 2S Li-poly battery, a BEC/ESC and 3 microservos, this little Sopwith Camel can really soar! Irwin covered his Guillows' kit with Polyspan and nitrate dope and spray-painted it with Aqueous acrylic paints. His Camel weighs only 15.6 ounces, has a 1.75-square-foot wing area and 8.9-ounces-per-square-foot wing loading. Nicely done, Irwin!

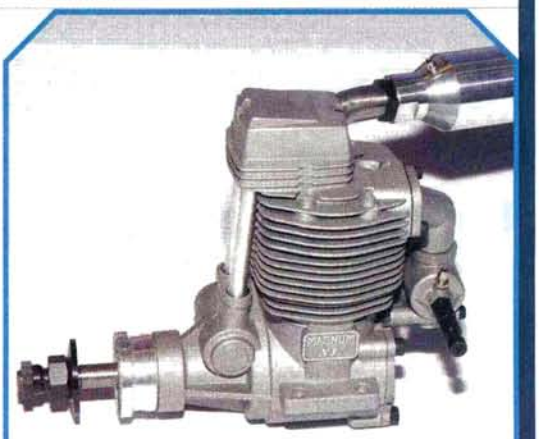
SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine, and we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. *Each month, one pilot's project will be selected as the "Project of the Month" and will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from among the published "Project of the Month" selections, so send us a photo and a brief description without delay! Send entries to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

>HIROBO
FREYA EVOLUTION 90

This versatile design can be your first .90-class heli, a definitive 3D sport ship, or an ideal F3C practice machine. Designed for U.S. pilots, the new Evo 90 has standout features that include a new rotor head and damping system; larger main-rotor thrust bearings; a massive 600cc fuel tank with new mounts; dual ball-bearing-supported pinion gear; stronger autorotation bearing; new, molded fore/aft (elevator) zero interaction control system; new, stronger front mechanical tray; and new-design, stronger boom strut terminals. This special U.S. version also includes a metal EX radius block, Teflon rudder-control-rod sleeves, an 8:45:1 engine-gear ratio and an aluminum third main shaft-bearing block. Add all of these advanced features to the great-looking scheme, and it's easy to see that Hirobo has another winner. The Evo 90 costs $650.
Hirobo; distributed by Model Rectifier Corp. (732) 225-2100; modelrectifier.com.

^PHASE 3
3D PROFILE BIPLANES

With performance to match their impressive looks, these two new aerobatic bipes combine easy assembly with hot 3D action. Each is made out of a special foam laminate that's lightweight yet strong, with factory-installed carbon-fiber strip spars and fuselage stiffeners. The undercarriage struts are also made of carbon-fiber and are attached to molded-plastic brackets on strengthened surfaces. You'll need only a 370 geared motor or a small brushless outrunner and a 4-channel radio to be ready to put on a show!
Phase 3; distributed by Hobby People (800) 854-8471; hobbypeople.net.



^MAGNUM
1.80 4-STROKE

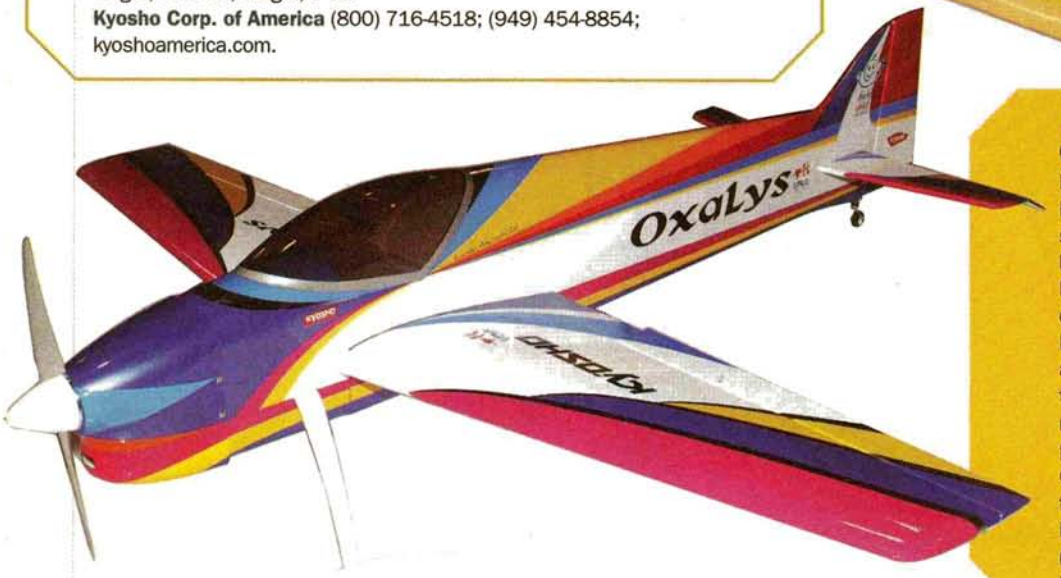
The engineers at Magnum are no strangers to excellent engine designs, so when they say they're excited about something, we take notice! This 1.80 4-stroke is their latest offering, and it boasts an all-new design that's sure to raise the bar in engine development. This smooth-running powerplant is easy to operate and has the very economical price tag of $349.99. If you're looking for a power boost for a 1.20 plane, your search is over because the Magnum 1.80 will fit perfectly into a 1.20-size engine slot. Like the rest of the Magnum line, it also comes with a two-year warranty.
Magnum; distributed by Global Hobby Distributors (714) 963-0329; globalhobby.com.

GIANTSCALEPLANES.COM
P-40 WARHAWK

Designed to have excellent flight characteristics, this ARF warbird looks just as good in the air as it does on the ground. It features a painted fiberglass fuselage and cowl, and the built-up wing and tail are covered with Solartex and then airbrushed. The plane also comes with wheels, a fuel tank and complete decal sheet. A 1.40 4-stroke and 4- to 5-channel radio with 5 or 6 servos are recommended. Specs: wingspan, 73 in.; length, 62 in.; weight, 10 to 11 lb.; wing area, 930 sq. in. The P-40 costs $280.
GiantScalePlanes.com (610) 282-4811; giantscaleplanes.com.

KYOSHO
SWING

What could be better than a high-performance glider that easily fits in the back seat of your car for impromptu flights? The easy-to-transport Swing comes fully assembled, with a built-up wing and tail, carbon-fiber boom and molded fuselage. It can be hand- or bungee-launched and is designed to have excellent stability and maximum lift. Specs: wingspan, 49 in.; length, 32.5 in.; weight, 7 oz.
Kyosho Corp. of America (800) 716-4518; (949) 454-8854; kyoshoamerica.com.



KYOSHO
OXALYS 50

Designed for precision aerobatics, this latest ARF from Kyosho features professional built-up construction, so you can be sure that it will fly exactly as you'd like. The Oxalys 50 comes with a molded cowl and wheel pants, control linkages, landing gear and wheels. The beautifully applied film covering is just the icing on the cake! A .40 to .50 2-stroke is recommended. Intermediate pilots who want to perfect their flying style will enjoy the Oxalys as much as pro pilots who need to practice for FAI/F3A competition.
Kyosho Corp. of America (800) 716-4518; (949) 454-8854; kyoshoamerica.com.

ULTRAFLY
FURIOUS & OUTRAGE

These small, foam, ARF biplanes offer big 3D thrills! Their sturdy EPS foam fuselages are strong enough for outdoor flying but are light enough for indoor fun. Their Depron foam wings are printed with graphics, and lightweight landing gear with foam wheels is also included. Factory-cut bays on the fuselage accommodate the battery, ESC, receiver and aileron servo; you can position the rudder and elevator servo bays wherever you'd like to customize your plane's center of gravity. Each plane comes with a set of light, strong, carbon-fiber pushrods as well as a set of easy-to-install, threaded-steel pushrods. Specs: wingspan, 28.3 in.; wing area, 313 sq in.; weight, 10.2 oz.; length, 30 in.; motor req'd, geared brushed motor or outrunner; radio req'd, 4-channel w/3 microservos.
Ultrafly; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; ultrafly.com.

ELECTRIFLY
HIGH-FREQUENCY SPEED CONTROLS

Designed for use with brushed Speed 280 to 600 motors, these new, fully proportional, BEC-equipped speed controls are compatible with Ni-Cd, NiMH and Li-poly batteries, and they have a low-voltage cutoff feature for maintaining control in the event of low battery power without damaging the batteries. The ESCs also feature fully proportional forward and safe start, and they come with installed motor, battery and receiver connectors. They're ideal for indoor, backyard and park flyers and cost from $35 to $80.
ElectriFly; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; electrifly.com.

GREAT PLANES
SPIRIT 100 ARF SAILPLANE

Move up from 2-channel, 2-meter sailplanes to the speed and maneuverability of the Spirit 100 ARF! Ailerons, flaps and spoilers increase the performance potential for swift, successful thermal chasing and pinpoint landing precision. The Spirit 100 features a fiberglass fuselage and two-piece balsa-and-ply wing covered in MonoKote, and all of the control surfaces (except the rudder) come hinged. An adjustable towhook is included for easy launches. The two-piece wing assembles and attaches easily, and high-quality Great Planes hardware is included. Specs: wingspan, 100 in.; wing area, 943 sq. in.; weight, 4 to 4.5 lb.; wing loading, 9.8 to 11 oz./sq. ft.; length, 54 in.; radio req'd, 5- to 6-channel w/7 servos (4 micro, 3 standard). The Spirit 100 costs $250.
Great Planes Model Mfg. (217) 398-6300; (800) 682-8948; greatplanes.com.

OVERALL WINNER

Mr. Top Gun Greg Hahn brings in his B-25D Mitchell for another perfect landing.

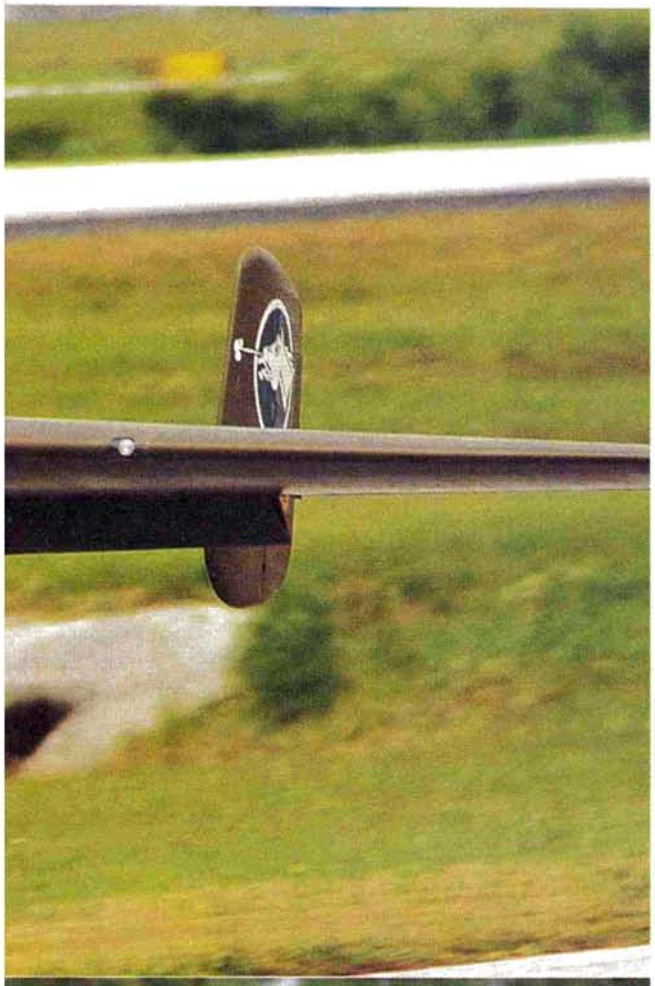
Third-place winner in Expert Kalvin Lim earned the Best Jet award with his Grumman F9F Cougar.

Chip Greene placed fourth in Pro/Am Pro with his Grumman Bearcat.

TOP GUN 05

STORY & PHOTOS BY GERRY YARRISH

17TH ANNUAL SCALE SHOOT-OUT!



Sixteenth in Expert, Richard Crapp won the Best Biplane award with this Fairey Swordfish.

Tommy Wood and Jerry Keller plced 11th in Team Scale with this impressive F-104 Starfighter.

HOSTED BY THE IMPERIAL RC CLUB at the Lakeland Linder Airport, Top Gun 2005 was held on April 27 to May 1. This year's Scale Invitational played host to 101 registered pilots, many of whom debuted never-before-seen aircraft. Contestants came from all points of the compass, including many international attendees to see who was the best and who would ultimately walk away with the title "Mr. Top Gun." This year, the popular Pro/Am class was expanded to include two separate groups of pilots: the Pro/Am "Professional" and the Pro/Am "Amateur" classes. The Pro/Am group does not have a "Builder-of-the-Model" rule and so is run much like the AMA Fun Scale competition. Twenty-five static judging points are awarded to all models having any type of documentation. If a contestant competes without providing documentation, no points are awarded. This arrangement basically makes Pro/Am a pilot's event, relying on flight points to determine a winner. By allowing the older, "three-year-rule" models to fly in this group and by bringing many new faces to the event, Pro/Am is quickly becoming a very popular segment of the total Top Gun picture. The Masters, Expert and Team classes all remained unchanged.

MR. TOP GUN

Greg Hahn, B-25D Mitchell Medium Bomber

Flying his 1/6-scale B-25D Mitchell medium bomber in Expert, Greg Hahn captured the top spot and the title "Mr. Top Gun" for 2005. In its all-olive-drab paint job and powered by twin 43cc Fuji gas engines turning 20x10 3-blade props, this 120-inch-span bomber looked as though it meant business! Greg enlarged Ziroli plans to produce the impressive 46-pound plane that he modeled after 1st. Lt. Fredrick M. Dick's "Tondelayo," which was part of the 500th Bomber Squadron, 345th Bomb Group Air Apaches.

Greg also won the top spot in Best Gas Performance and garnered the most points in the High Total Flights (combined Expert and Masters) class.

FIRST PLACE MASTERS CLASS

David Hayes, Rockwell Thrush

Proving that you don't need a big WW II fighter or a turbine-powered jet to win at Top Gun, David Hayes placed first with his beautifully executed Rockwell Thrush crop-dusting plane. Built from his own plans, David's Thrush is 1/4.5 scale, has a 108-inch span, weighs 29 pounds and is powered by a Saito 1.80 4-stroke engine turning an 18x6 prop. The model also dispensed a fine crop-dusting powder as Dave made his prototypically low flybys and aggressive, vertical turn-around maneuvers to replicate a very convincing Ag-plane presentation.

FIRST PLACE TEAM

David Shulman & Joe Grice, F-86 Sabre Jet

Builder Joe Grice (left) and pilot David Shulman nailed first place in Team Scale with their impressive F-86 Sabre Jet. Joe built the Sabre Jet using a BVM kit and powered it with a JetCat Titan turbine. The 80-inch-span jet is 1/6.5 scale and is beautifully finished in Flite-Metal aluminum sheet. David earned the High Total Flight Score award in Team, and Joe picked up the Critics' Choice runner-up award for his building efforts.

Jason Shulman

Craig Gottschang

PRO/AM CLASSES

Jason Shulman (Pro), F-86 Sabre Jet
Craig Gottschang (Am), Rafale B-01

Originally formed for pilots who fly aircraft that were no longer allowed at Top Gun because of the three-year-rule and for those flying models that weren't built by the pilot, the Pro/Am class was divided into two groups. The Pro/Am Pro and Pro/Am Am classes more closely grouped the piloting skills to give the new classes a more level playing field. The Am class is for those who have never flown at Top Gun before and for those who have flown but finished in the lower 50 percent. The end result was that more pilots competed, and more aircraft were exposed to the general public.

★ The winner of the Pro/Am Pro class was Jason Shulman with a 1/6-scale F-86 Sabre Jet owned by Jim Jensen and built by Joe Grice. Built from a BVM kit, the F-86 has an 80-inch span, weighs 35 pounds and is powered by a Jet Cat Titan turbine engine.

Jason also won the Best Jet Performance award and the High Total Flight Score award for the Pro/AM Pro class.

★ On his first trip ever to Top Gun, Craig Gottschang placed first in the Pro/Am Am class. He did a great job flying his 1/7-scale, 61-inch-span BVM Rafale B-01 that was powered by an AMT AT-450 turbine.

TOP GUN '05

Sung Kim and Henry Nguyen earned seventh place in Team with their beautiful Grumman Panther.

TOP GUN WINNERS

MASTERS

PLACE	PILOT	MODEL	STATIC SCORE	TOTAL SCORE
1	David Hayes	Rockwell Thrush	96.667	189.667
2	Bob Violett	F-86F	96.000	188.958
3	David Ribbe	MiG-15	94.167	187.959
4	Richard Feroldi	Albatross D.V	97.000	187.083
5	Hal Parenti	Ryan Fireball	92.333	186.125

EXPERT

1	Greg Hahn	B-25D Mitchell	95.250	190.167
2	Terry Nitsch	F-100 Super Sabre	95.250	190.024
3	Kalvin Lim	Grumman Cougar	94.000	185.797
4	Jack Diaz	F-100D	93.583	185.787
5	Larry Folk	Super Cub	93.167	185.667

TEAM SCALE

	PILOT/BUILDER			
1	David Shulman/Joe Grice	F-86F	97.333	192.958
2	Dave Pinegar/George Maiorana	AEW	96.333	190.833
3	Paul Bageman/Mark Taylor	F-100D	97.000	189.814
4	John Redmond/Kelly Rohrbach	F-100F	96.250	189.636
5	Ray John/Mike Selby	Vindicator	96.250	188.917

PRO/AM PRO

1	Jason Shulman	F-86	25.000	121.792
2	Tom Dodgen	MiG-15	25.000	119.958
3	Brian O'Meara	P-47	25.000	119.625
4	Chip Greene	Bearcat	25.000	119.625
5	Frankie Mirandes	MiG-15	25.000	119.250

PRO/AM AM

1	Craig Gottschang	Rafale B-01	25.000	119.042
2	David McQueeney	Bulldog Pitts	25.000	115.833
3	John Burdin	F-5E	25.000	114.208
4	Tim Sparks	Gamma Racer	25.000	113.042
5	Howard Leipzig	Sea Fury	25.000	112.542

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Special thanks to:
City of Lakeland
Imperial RC Club

Ray John and Mike Selby earned fifth in Team Scale with this Vought SB2U-2 Vindicator. Mike also won the Critics' Choice Award.

Peter Goldsmith placed seventh in the Pro/Am Pro class with his 1/12-scale, 138-inch-span B-17 Flying Fortress. He also earned the Best Multi Performance award.

Gary Allen and pilot Dorin Luck earned a 10th-place finish in Team with Gary's 1/3-scale Bucker Jungmeister. The 86-inch-span biplane is powered by a Zenoah G-62.

This Nakajima Tenzan (Jill) torpedo bomber is the work of Dave Foster. The 1/6.5-scale, 90-inch Japanese warbird is powered by a Moki 2.10. Dave placed 10th in Masters.

TOP GUN '05

This F-100F Super Sabre won second place in Expert for Terry Nitsch.

TOP GUN AWARDS

Masters High Static	Dick Konkle; 98.16	Aeronca
Expert High Static	David Toyer; 95.41	Messenger
Team High Static	Graeme Mears; 98.58	Super Cub
Best Civilian Aircraft	Dick Konkle	Aeronca
Best Military Aircraft	Mike Selby	Vindicator
Best Biplane	Richard Crapp	Fairey Swordfish
Best Pre WW2 Aircraft	David Toyer	Miles Messenger
Best Jet	Kalvin Lim	Cougar
Best Pro/Am Entry	Dino DiGiorgio	P-47
Engineering Excellence	Gustavo Campana	Su-37
Best Cockpit Interior	Dick Konkle	Aeronca
Charlie Chambers Craftsmanship	Graeme Mears	Super Cub
Critics' Choice	Mike Selby	Vindicator
Critics' Choice Runner-up	Joe Grice	F-86F
Grey Eagle	Bill McCallie	
Top Buns	General Ray John	

FLIGHT AWARDS

Best 4-Stroke Performance	David Hayes	Thrush
Best Gas Performance	Greg Hahn	B-25
Best Multi Performance	Peter Goldsmith	B-17
Best Jet Performance	Jason Shulman	F-86
High Total Flights (Pro/Am)	Jason Shulman	F-86
High Total Flights (Team)	David Shulman	F-86
High Total Flights (Expert & Masters)	Greg Hahn	B-25

Seventh-place Masters finalist Dave Johnson with his Albatross D.III—a future *Model Airplane News* plan!

Top Gun is all about the pilots and the aircraft they fly; that's why event organizer, Frank Tiano, took it to the Lakeland Linder Airport. This venue is a dream come true for serious scale competition, and Frank even invested in new sod to improve the grass strip next to the long, paved taxiway that forms the main runway.

This year's competition was incredibly close, and the level of craftsmanship and pilot skill is the highest you'll find anywhere. Both WW I and WW II fighters shared the sky with turbine-powered jets and multi-engine aircraft. This year has to be recognized as the year of variety, as no single type of aircraft seemed to have an edge over any other. With challenging wind conditions to spice things up, the flight order moved briskly. No one could rest on his laurels; every static point and every flight maneuver counted. At the end, the difference between the title, Mr. Top Gun, and second place in Expert was a miniscule 0.143 point. Now, that's calling it close!

The secret of Top Gun's success is not just the quality of its competitors but also its well-organized logistics. The static and flight judges, the flightline coordinators, the scorekeepers and all the other volunteers from the host club gave a superhuman effort to make it go off without a hitch. It's a first-class act through and through. Check out the photos on this and the preceding pages for highlights of these award-winning aircraft.

Of course, there's no way to cover everything that happened in just one article, so take the Click Trip to see even more of the terrific models that participated in this year's event, and be sure to leave the last weekend in April open on your 2006 event calendar! For more information on Top Gun, check the FTE website at franktiano.com.

click trip MODELAIRPLANENEWS.COM FOR MORE PHOTOS


N2FC

BY SAL IASILLI > PHOTOS BY SAL IASILLI

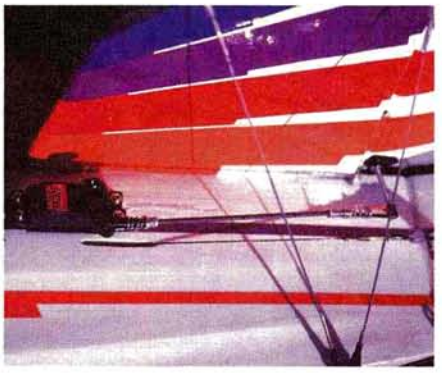
SKYSHARK R/C

CHRISTEN EAGLE II

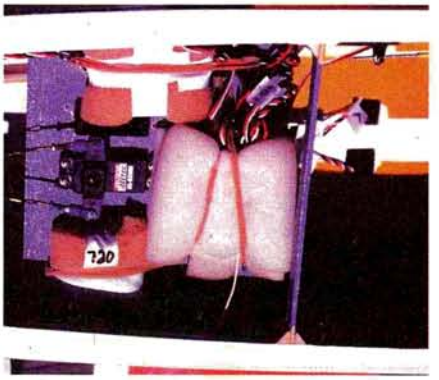
A HANDFUL OF EXCITEMENT IN A COLORFUL ARF PACKAGE

WHEN FRANK CHRISTENSEN DESIGNED THE FULL-SCALE CHRISTEN EAGLE II, he intended to develop a kit plane that would be a refinement of the Pitts S2A. The Eagle sports a redesigned cockpit and canopy, a streamlined cowl and wheel pants, a reshaped tail and wingtips and a spring landing gear. Although the aerobatic capabilities of the Eagle and Pitts have been overtaken by the new generation of aerobatic monoplanes, the Eagle is still a highly desirable aircraft.

Skyshark R/C spent three years developing its Christen Eagle II ARF model, preserving the scale outline and accuracy of the full-scale plane as much as possible. (Aviat Aircraft, the manufacturer of the full-scale Eagle, also collaborated on the design!) As a result, this plane has incredibly accurate scale outline, wing platform, control surfaces and stabilizer. CAD design allowed strength to be built into the airframe without sacrificing its light weight.



The elevator control linkage is short and slop free. The rudder uses pull-pull cables. Notice the tail bracing wires.



The radio compartment has plenty of room.

SPECIFICATIONS

MODEL: 27.5% Christen Eagle II
MANUFACTURER: Skyshark R/C Corp.
TYPE: giant-scale aerobat
WINGSPAN: 64.8 in. (top wing); 62 in. (bottom wing)
TOTAL WING AREA: 1,371 sq. in.
WEIGHT: 16 lb. 7 oz.
WING LOADING: 27.62 oz./sq. ft.
POWER REQ'D: 1.00 to 1.60 2-stroke, 1.20 to 1.80 4-stroke, or lightweight 26cc to 40cc gas
RADIO REQ'D: 4- to 8-channel
PRICE: $489.95*
*As a special offer to *Model Airplane News* readers, the Christen Eagle II is available for $339.95 (including shipping). Simply mention this review to receive the discount.

COMMENTS

The Skyshark Christen Eagle II is a high-end ARF that not only looks sharp but also flies exceptionally well.

HIGHLIGHTS

- Eight-color graphics
- First-rate finished fiberglass parts
- Completely built-up airframe that is professionally covered

THE MODEL

The Christen Eagle II features a built-up balsa and ply fuselage, wings and tail surfaces, Oracover covering and factory-applied wing and fuselage decals. It has CA hinges on all control surfaces and sports a painted-fiberglass cowl, wheel pants, belly pan and gear boots, painted-aluminum cabane struts and painted-aluminum spring landing gear with 4-inch rubber main wheels and a 1¼-inch tailwheel. A cockpit instrument-panel kit, painted canopy and frame, flying wires and a 3.5-inch turned aluminum spinner also add to its great looks. All mounting hardware is included along with an adjustable aluminum engine mount, adjustable firewall box and 19-page, photo-illustrated instruction manual.

ON WINGS OF EAGLES

Let's start with the bottom wing. It is very important to set it at the correct 1$^{3}/_{16}$-inch dihedral for the wing struts to line up with the predrilled holes in the wings. I sanded the two root ribs so the wings fit flush together. It is also very important that the trailing edge of the lower wing be straight from tip to tip. I fit the bottom wing together using the angled hardwood spar and placed the wing, bottom side down, on a flat table; then I placed a 1$^{3}/_{16}$-inch block under one wingtip. When I had the correct dihedral and the trailing edge was straight, I used 30-minute epoxy to join the wing halves. I placed heavy books on top of the lower half of the wing to hold the alignment while the epoxy dried.

The top wing has no dihedral, and the halves are joined with a straight joiner spar on a flat table, also with 30-minute epoxy. I used masking tape here to ensure correct alignment at the leading and trailing edges of the wing. When the epoxy had fully cured, I installed the two supplied hardwood dowels at the front of the lower wing with 6-minute epoxy and fit the wing to the fuselage. I aligned the wing with the lower fuselage and drilled the holes for the lower wing bolts; then I fit the fiberglass belly pan to the lower wing and fuselage and epoxied it into place. The wings have four servo-mounting hatches that are each secured with small wood screws. I originally installed four servos in the wings to activate the four ailerons, but I didn't like the extension wire hanging from the top wing into the fuselage. I decided to use two high-torque servos in the lower wing and to activate the upper wing ailerons with slave-driven pushrods. I used 22-gauge wire for the two servo-extension leads to the receiver—one for each aileron channel.

FUSELAGE

I started by using 30-minute epoxy to install the stabilizer and fin in the precut slots in the fuselage; I aligned them with the lower wing. I added the four bracing wires to the tail assembly for additional rigidity. The upper wing cabanes and the landing gear are easy to install; just use screws to attach them to the predrilled holes in the fuselage, and tighten the screws into factory-installed blind nuts. I substituted a C.B. Tatone leaf-spring tailwheel assembly for the supplied tailwheel assembly. Although the prototype Eagle II was designed around a 1.50 4-stroke, I wanted to use a gas engine that was light, compact and powerful, and I found that combination in the new RC Showcase Roto 35vi Redhead. It weighs less than 4 pounds and puts out more than 4hp and 21 pounds of torque. You can move the adjustable firewall box into or out of the front opening of the fuselage as needed for the length of your engine.

I began by marking two centerlines on the front of the firewall box. I then aligned the engine centerline with the centerline of the firewall with the engine bolted to the aluminum mount. I drilled four holes and used 8-32 machine bolts and locknuts to secure the engine mount to the firewall. I also had to enlarge the center hole in the firewall to a 1-inch diameter and add ¼-inch hardwood strips to the rear of the engine mount to allow clearance for the Roto 35vi's rear-mounted carburetor. I then inserted the firewall box into the fuselage front opening with the engine attached to it, and I temporarily attached the cowl to the fuselage. I had to slide the engine box as far in as it would go to get the recommended ⅛-inch space between the front of the cowl and the spinner backplate. I used a metal square to make sure that all the sides of the firewall box were even with the firewall. This is very important because the right thrust and downthrust are built into the front of the firewall box. After I had aligned the box with the fuselage, I marked all the lines on the four sides of the engine box as an alignment guide and epoxied the box into the firewall. For added strength, I attached two aluminum brackets to the firewall and mounting box. I epoxied four hardwood blocks to the firewall—two at the top and two at the lower sides—and I then aligned the cowl with the rear of the spinner backplate, with an ⅛-inch gap between the spinner and the cowl. I used masking tape to hold the cowl in place and then tapped and drilled the four blocks and used four 8-32 nylon bolts to secure the cowl.

RADIO INSTALLATION

I used two high-torque Hitec servos for the

IN THE AIR

The RC Showcase Roto 35vi Redhead engine is powerful and quiet with almost no vibration, and it turned out to be an excellent match for the Skyshark R/C Christen Eagle. Ground handling and in-flight performance exceeded my expectations.

CONTROL THROWS

Ailerons: ± 1 in. (high); ± 5/8 in. (low)
Elevator: 1 3/4 in. up, 1 5/8 in. down (high); 1 1/4 in. up, 1 in. down (low)
Rudder: ± 2 in. left & right (high); 1 3/8 in. left & right (low)

GENERAL FLIGHT CHARACTERISTICS

>Stability: the plane is rock solid throughout the entire flight envelope, from full power to idle.
>Tracking: once the Eagle is properly trimmed and balanced, tracking is straight and true from takeoff to landing.
>Glide performance: surprisingly (for a biplane!), the glide rate is fairly good even throttled down to its lowest idle. I have yet to experience a deadstick engine with the Roto 35vi.
>Stalls: putting the nose at a high angle of attack and cutting back on the throttle will definitely result in a stall. Adding power and elevator combined will instantly recover the aircraft to normal flight.
>Aerobatics: that's what this plane is all about: from simple loops to mind-boggling snap rolls. As long as you have the right engine power and skills, this plane will do what the full-size Eagle can do—and more.

PILOT DEBRIEFING

The colorful graphics—eight different colors!—on this Christen Eagle are among the biggest attractions at the flying field. When a spectator asks, "How does it fly?" I just say, "Sit back and watch!" After my so-called aerobatic demo of loops, Cuban-8s, axial rolls, hammerheads, snap rolls and several touch-and-go landings, the next question is usually "Where can I order one?"

bottom wing ailerons and teardrop-shaped hardwood pushrods to activate the upper wing ailerons as per the full-scale Eagle II. I needed two 14-inch extension wires for the two wing servos to reach the receiver ports. I also used high-torque Hitec servos for the elevator mounted in the side rear of the fuselage and another high-torque Hitec servo for the rudder along with a pull-pull setup to the rudder and servo arm. I used a standard Futaba servo for the engine throttle. Two battery packs (a 1200mAh and a 720mAh) and two heavy-duty Electro Dynamics switches provide power to the receiver. I mounted the battery packs on each side of the servo-mounting plate. I used another 12mAh pack for engine ignition and mounted it in front of the rear lower wing on the right side of the fuselage.

GEAR USED

RADIO: Futaba FP-T7UAP w/Futaba 7-channel, PCM receiver and 4 Hitec H5635HB servos (2 ailerons, 1 rudder, 1 elevator); 1 Futaba S3004 servo (throttle)

ENGINE : RC Showcase Roto 35vi

PROP: RC Showcase 20x10

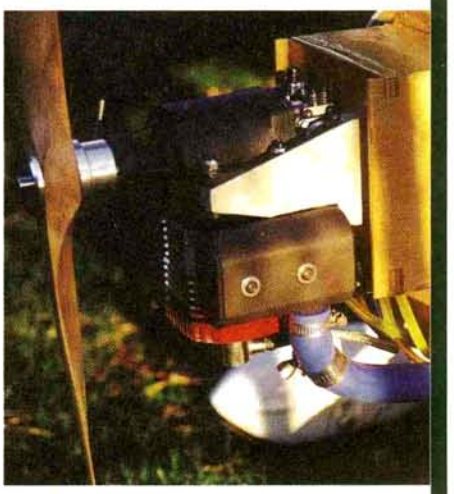
FINAL ASSEMBLY

To secure the canopy to the frame, I first lined the cockpit area with plastic wrap and inserted the frame into the fuselage. I then put a thin bead of 30-minute epoxy around the canopy frame and gently applied the canopy. The plastic wrap prevents you from accidentally bonding the canopy frame to the fuselage. I held the canopy in place with masking tape while the epoxy cured. I fit the wheel pants, the gear boots and the wheels to the main gear according to the instruction manual.

I applied the Eagle decals and lettering to the cowl with soapy water and allowed them to dry overnight. When the final assembly was complete, I bolted the wings to the fuselage and mounted the two wing struts. I used a Robart incidence meter to check the upper and lower wing incidence. The top wing should have +1 degree, and the lower wing should have zero. While checking the alignment, I found that the right lower wing panel had a slight wash-in, giving that wing panel +½-degree incidence. I twisted the wing in the opposite direction, used a heat gun and was able to reduce most of the warp.

CONCLUSION

The workmanship on the Skyshark R/C Christen Eagle II is the best I've seen on an ARF. It scores high marks for its scale fidelity, high-quality construction, multi-colored decals and beautifully finished fiberglass components. And it looks superb in the air! Whether you're an intermediate or an advanced pilot, this bipe will definitely make you look like a pro. What more could you ask for? +



I used the RC Showcase Roto 35vi Redhead to power the Eagle. It fits nicely because of the adjustable firewall-box design, and it powers the model with authority.

See the Source Guide on page 151 for manufacturers' contact information.

> **THE P-40E WARHAWK offers a flight performance that even expert pilots will enjoy.**

BY JOHN REID > PHOTOS BY JOHN REID

HANGAR 9

P-40E WARHAWK

REVIVE THE LEGEND OF THE FLYING TIGERS

THE P-40 WARHAWK WAS ONE OF WW II'S most popular U.S. fighter planes. The P-40E was a heavily armed and armored aircraft that was used to major advantage by the American Volunteer Group (AVG) in China. Better known as the famous Flying Tigers, the AVG was a secret operation of American airmen recruited to stop the advance of the Japanese into Southeast Asia.

Hangar 9 now has a new P-40E ARF that is an accurate scale rendition of an actual Flying Tiger aircraft owned by Rudy Frasca of Urbana, IL. When I found out that this plane was available, I knew it had to be my next scale aircraft.

SPECIFICATIONS

MODEL: P-40E Warhawk
MANUFACTURER: Hangar 9
DISTRIBUTOR: Horizon Hobby Inc.
TYPE: sport scale
LENGTH: 52 in.
WINGSPAN: 64.6 in.
WING AREA: 709.4 sq. in.
WEIGHT: 8 lb. 15 oz.
WING LOADING: 29.03 oz/sq. ft.
ENGINE REQ'D: .61-.70 2-stroke, .91-1.0 4-stroke
RADIO REQ'D: 5-channel w/6 servos
PRICE: $259.99

COMMENTS

The P-40E Warhawk is a well-built ARF kit with excellent instructions. The flight performance is on par with a pattern plane's; this is one of the most stable semi-scale aircraft I have had the pleasure to fly.

HIGHLIGHTS

- The parts fit as they should
- 90-degree rotating retracts installed
- Great flight performance

OPENING THE BOX

The P-40E Warhawk kit includes the fuselage, two wing panels, an elevator and a rudder—all expertly covered in a three-color camouflage scheme—and a fiberglass cowl and belly pan along with a clear-plastic canopy. It also includes a sheet of decals, a tank, an adjustable engine mount, wheels, a steerable tailwheel, installed 90-degree, rotating, manually retractable landing gear, a very complete hardware package and a well-written manual.

ASSEMBLY

Before I begin any kit, I always read through the manual at least once and quickly inventory the parts. I had my covering iron at the ready, but I found only a few wrinkles.

Wing Assembly begins with joining the two wing panels. After I made a centerline on the wing joiner, I inserted it into the roots of each wing and checked the fit of the two wing panels. Everything looked good, so I mixed up about 1 ounce of 30-minute epoxy and applied it evenly to all three parts. I used blue painter's masking tape to hold the wing panels together securely until the epoxy had cured. I removed the tape from the wings and marked the location of the wing bolt plate, removed the covering and used medium CA to glue the plate onto the bottom of the wing. Then I epoxied the two ¼x20 blind nuts into the back of the fuselage wing saddle, making certain not to get any epoxy on the threads.

I mounted the wing on the body and positioned the belly pan in the proper location on the bottom of the wing. I then traced around the belly pan with a fine felt-tip pen so I could remove the wing covering and glue the belly pan in the proper location. Because only about an ⅛-inch-wide strip of covering needs to be removed, I used the belly pan as a guide for my hobby knife. This created the perfect contour cutout that followed the exact curvature of the belly pan. I used medium CA to glue the belly pan into place. With the wing in place, I used it to align the horizontal and vertical stabilizers.

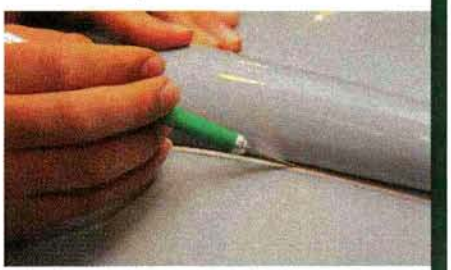
Tail feathers I slid the stabilizer into the fuselage and measured the distance from the wingtips to the stabilizer tips. When they were equal, I marked the stabilizer where it is inserted into the fuselage. After I removed the covering from between the marks, I applied some 30-minute epoxy and reinserted the stabilizer in the fuselage. I installed the fin in exactly the same manner. I hinged all of the control surfaces into their proper location and made sure that they moved freely.

Retracts The retractable landing gear are already installed, but they do require you to install a low-profile retract servo; I used the JR NES-791. By following the directions and using the proper servo, I found the retract setup to be among the easiest I've done. I attached the two quick connectors to the servo arms at the distance outlined in the manual, and the retracts performed perfectly the first time with a positive lock up and down.

The wheel wells can be installed using epoxy, but I opted for clear tape so I'll be able to remove them easily when I need access to the linkage underneath. The landing-gear flaring has molded-in lines to show you exactly where to cut, but I needed to cut the opening a little wider so that the retract gears would not hit the flaring.

Engine installation The P-40E cowl has plenty of room for any engine of the recommended size. I opted to go with the Saito 100 GK 4-stroke; I felt it offered the best power for a plane of this size as well as the reliability I needed. The engine mount adjusts to accommodate all the recommended engine sizes. I followed the manual's installation instructions for 4-strokes and had the Saito mounted in no time at all. As a precaution, I used thread-lock on the blind

All the servos have a reatively short pushrod connection to the control surfaces, and this provides solid control response.



Using the belly pan as a guide, I was able to make cutouts in the covering that exactly matched the belly pan's curvature.

My modified military doll adds a touch of realism to the cockpit's detailing.

IN THE AIR

The P-40E has very good ground-handling characteristics, probably because of its stout and stable landing gear. On takeoff, I began by applying the throttle and maintained the heading with the rudder; the plane requires a fair bit of up-elevator to prevent it from tipping over at the beginning. Once in the air, it is very easy to fly. Landings are a breeze and don't require as much airspeed as other scale planes I have flown. I easily slowed this plane down to a reasonable speed for landing without fear of stalling.

CONTROL THROWS

Elevator: ± 1⅛ in. (high); ± 1 in. (low); expo: 20/40%
Aileron: ± ⅝ in. (high); ± ½ in. (low); expo: 20/40%
Rudder: ± 1½ in. (high); expo: 20%

GENERAL FLIGHT CHARACTERISTICS

- **Stability:** solid and predictable; it goes exactly where it is pointed.
- **Tracking:** this plane tracks more like a pattern plane than a scale warbird.
- **Aerobatics:** this model can do anything the full-size P-40E can do.
- **Glide performance:** for a warbird, it has an excellent glide; deadstick landings are not to be feared.
- **Stalls:** when flown slowly enough, it will stall; all of my stalls caused the left wing to drop, but recovery was quick and predictable.

PILOT DEBRIEFING

Hangar 9's P-40E is an absolute joy to fly. Its rock-solid flight performance and accurate controls allow you to perform maneuvers you might not think about doing with other warbirds. Loops, rolls, 4-point rolls, stall turns, snaps, Immelmanns and Cuban-8s are all possible. The rolls do require proper elevator and rudder management to keep them looking axial. I even managed a respectable low knife-edge pass. This plane's flight performance is so solid that you'll do low "gear-up" flybys on your first flight and, of course, pull up into a nice rollout.

The landing gear are durable and solid and extremely reliable. I've had a number of flights on smooth and rough dirt runways without any gear mishaps. You will enjoy flying this warbird.

nuts and secured the engine mount to the firewall with bolts.

I assembled the tank according to the instructions and did a pressure check underwater to make sure that there were no leaks. I could not install the fuel tank all the way in the front of the fuselage because the carburetor was too close to the firewall. I routed the fuel lines out of the center hole in the firewall and filled in the open space with some clear silicone sealant. To make fueling easier, I installed a Du-Bro Kwik-Fill fueling valve on the firewall using a corner bracket.

GEAR USED

RADIO: JR 10X transmitter; R770 receiver; and 4 DS 8411, 1 NES 537 and 1 NES 791 low-profile retract servos

ENGINE: Saito FA100GK 4-stroke

FUEL: Performance Plus

PROP: Zinger Pro 14x8

Radio gear and final assembly I installed the rudder and elevator servos close to their control surfaces; each required an 18-inch servo extension. I tied the servo connector and servo extension together with dental floss. I deviated slightly from the instructions when I installed the servo-mounting blocks to the aileron hatch. On the side of the servo where the wire exits the body, I cut a slight V-notch in the mounting blocks before I epoxied them to the servo hatch. I then installed the receiver and the battery so that I could center the servo arms before I hooked up the linkage. When they were centered, it was easy to hook up the linkage using all the kit-provided hardware.

I made the required cutouts on the cowl and then used hobby scissors to trim out the cockpit backrest and canopy. I used the top half of a cheap military doll as my pilot; it's glued into the cockpit with canopy glue. I also attached the canopy with J&Z Products Super RC Z 56 canopy glue. When the canopy was dry, I rounded off the decals' corners and attached them to the body with soapy water. I set the control throws and the CG to the manufacturer's recommendations. I had to add 13 ounces of nose weight to get the plane to balance.

FINAL THOUGHTS

The Hangar 9 P-40E Warhawk is one of the easiest-to-assemble scale ARFs I have ever built. At the flying field, I found that its flight envelope resembles that of a pattern ship more than a semi-scale warbird's. This is the perfect semi-scale plane for the pilot who has just graduated from a low-wing trainer, and it offers a flight performance that even expert pilots will enjoy. ✈

See the Source Guide on page 151 for manufacturers' contact information.

THE WORLD MODELS MANUFACTURING CO. LTD.
OFFICE : UNIT 23-24, 10/F, KOWLOON BAY INDUSTRIAL CENTRE,
15 WANG HOI RD, KOWLOON BAY, HONG KONG
TEL : (852) 2707 9783 FAX : (852) 2798 0728
www.theworldmodels.com email : info@theworldmodels.com
www.radarrc.com email : info@radarrc.com

NEW

SPECIFICATIONS

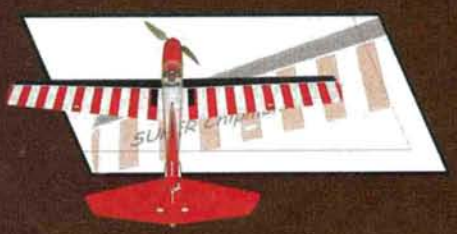
Wing Span	: 39.5 in / 1000 mm
Wing Area	: 260 sq in / 16.5 sq dm
Flying Weight	: 25.5 oz / 720 g
Fuselage Length	: 32 in / 810 mm
Requires	: 4 channel ratio w/ 4 micro servos, 15A(8 cells) speed controller, 8 cells 1000 mAh battery & charger

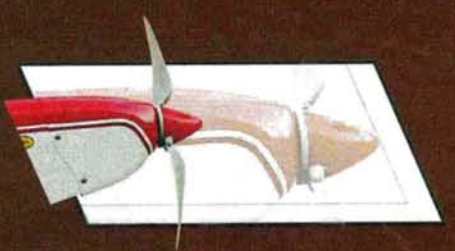
SUPER Chipmunk-EP

Code No : E205

- Scaled park fly fabricated with top quality balsa / plywood and covered with genuine heat shrink covering. Strong wood structure and tough covering give the airframe the best load to weight ratio and capability for further power upgrades.
- Full house controls (allerons, elevator, rudder, and throttle) extend maneuvering limits and deliver scale flying.
- Fully symmetrical airfoil enhance aerobatics performance.
- Comes with geared speed 400 motor and propeller.
- Strong and light pre-painted PVC cowling.
- All necessary hardware and accessories provided including the Ultralite pilot which greatly enhance scaled look without weight penalty.

Almost - Ready - to - Fly





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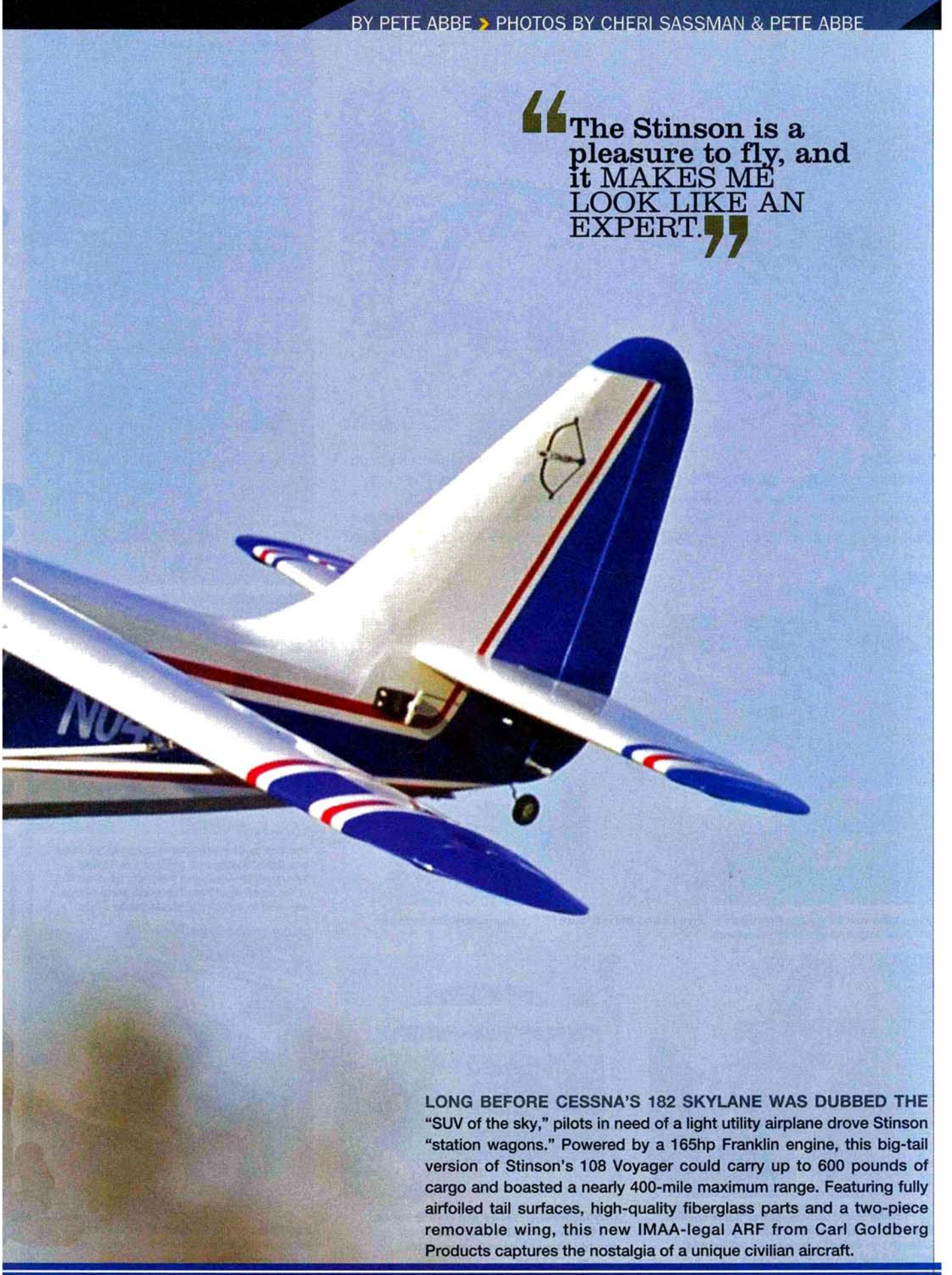
CARL GOLDBERG PRODUCTS

STINSON 108 ARF

THE CLASSIC FLYING STATION WAGON

BY PETE ABBE > PHOTOS BY CHERI SASSMAN & PETE ABBE



> "The Stinson is a pleasure to fly, and it MAKES ME LOOK LIKE AN EXPERT."

LONG BEFORE CESSNA'S 182 SKYLANE WAS DUBBED THE "SUV of the sky," pilots in need of a light utility airplane drove Stinson "station wagons." Powered by a 165hp Franklin engine, this big-tail version of Stinson's 108 Voyager could carry up to 600 pounds of cargo and boasted a nearly 400-mile maximum range. Featuring fully airfoiled tail surfaces, high-quality fiberglass parts and a two-piece removable wing, this new IMAA-legal ARF from Carl Goldberg Products captures the nostalgia of a unique civilian aircraft.

SPECIFICATIONS

MODEL: Stinson 108
MANUFACTURER: Carl Goldberg Products
TYPE: giant-scale ARF
WINGSPAN: 81 in.
WING AREA: 829 sq. in.
LENGTH: 62 in.
WEIGHT: 12.5 lb.
WING LOADING: 35 oz./sq. ft.
POWER REQ'D: .75 to 1.08 2-stroke; .91 to 1.20 4-stroke
RADIO REQ'D: 5-channel w/8 servos
PRICE: $400

COMMENTS

The Carl Goldberg Products Stinson 108 is a nicely constructed, IMAA-legal ARF that features fiberglass parts and a complete, high-quality hardware package. Its superior flight performance makes it ideal for pilots who are looking for their first giant-scale airplane.

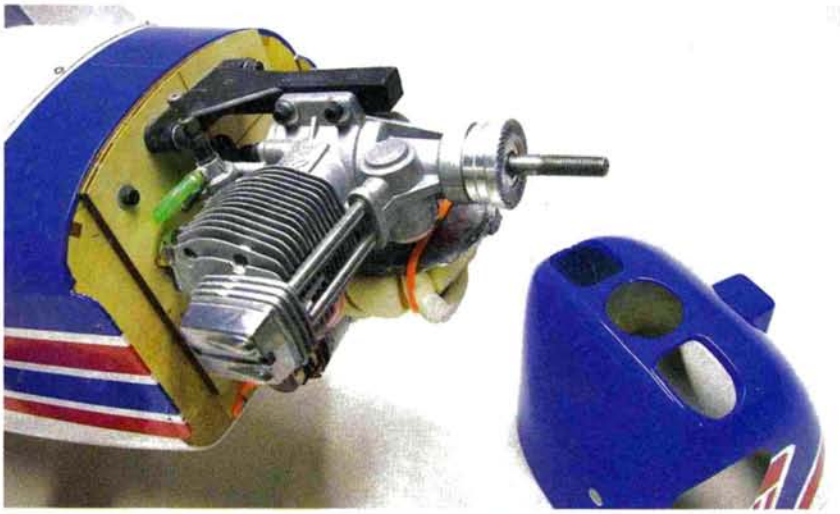
HIGHLIGHTS

- Built-up laser-cut balsa and ply construction
- Virtually all the hardware is supplied
- Majestic, scale-like flight performance

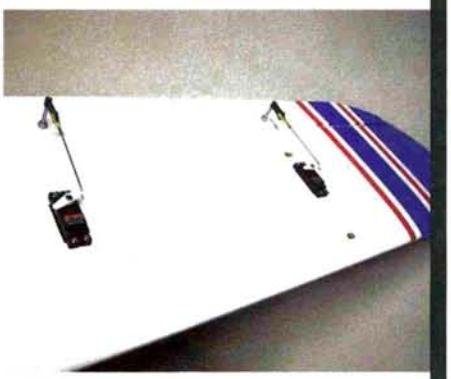
THE MODEL

The Stinson arrived well packed and in good shape. The wings, fuselage and tail feathers were very accurately built up of laser-cut balsa and ply components. Close inspection revealed small cracks and broken glue joints in the cabin's lite-ply formers. These were quickly repaired with thin CA.

Formed parts include a painted fiberglass cowl and wheel pants and a clear windshield



The engine can be mounted horizontally or vertically. The O.S. 1.20 FS fits nicely under the hood and provides ample power for all maneuvers.



The flap- and elevator-servo linkages are short and tight. A computer radio or a reversing Y-harness is required to keep the flaps moving in the same direction. The small brass straps are used to attach the struts to the wings.

The stabilizer and elevator halves are removable. They ride on two aluminum tubes that pass through the aircraft's fin and are retained by two 4-40 bolts.

Only the receiver, rudder and throttle servos are installed in the model's large cabin. They're accessed through a removable, clear-plastic hatch.

A pull-pull cable system actuates the rudder and tailwheel. Each elevator half is driven by an independent servo.

STINSON 108: POSTWAR MINI-LINER

IT ALL SEEMED SO LOGICAL: WW II HAD JUST ENDED, and it made sense to assume that many returning military pilots would want their own airplanes. So, to avoid missing even a minute of the predicted sales boom, every aircraft plant in the nation started cranking out general-aviation airplanes day and night. In 1946, an incredible 38,000 general-aviation airplanes were produced. By comparison, in 2002, barely 2,200 of all types were delivered.

Then, in early 1947, someone noticed that oddly, the airplanes flowing out through the factory doors weren't going anywhere; they were just sitting there unsold. The boom had turned out to be a bust, so aircraft plants slammed on the brakes, and many went under.

Like the other manufacturers, Stinson Aircraft was popping out airplanes like cookies. Unlike most of the others, however, the Stinson folks thought that returning pilots would need four-seat family airplanes, so they took their prewar two-place 10A (Model 105), re-engineered it a bit and came up with the 108—a vaguely art-deco-style tail-dragger that, to this day, is considered to be a great four-place airplane. More than 5,000 were built between 1946 and 1949.

Stinson airplanes have always enjoyed a reputation as real "pilots' airplanes" because they fly and handle so well, and the 108 is no exception. For example, it has silky-smooth ailerons that no general-aviation airplane today can match.

The late 1940s was a marketing slugfest as manufacturers scrambled for their piece of a shrinking pie. Stinson responded by continually upgrading the 108—going from 150 to 165hp and redesigning its interior. The 108-3 (identified by its larger-than-life vertical stabilizer) set a high mark in aircraft interiors with its wagon-like wooden trim (hence, its nickname: the "station wagon").

When you open that thick door and climb onto the step to board the airplane, it's impossible to escape the feeling that you're sliding behind the wheel of an old Packard or Lincoln. The seat is wide, the big control yoke is right where it ought to be, and the panel echoes the plane's overall art-deco design.

Whereas most light aircraft of the period use 4-cylinder engines, the Stinson has a 6-cylinder Franklin, and you notice it as soon as you light the fires; the engine is supersmooth and sounds throaty.

You can't see squat over the nose, as is usual in a tail-dragger, so when taxiing, your view is limited to a triangle out through the left side, and you have to S-turn to avoid running over such things as small buildings. On takeoff, however, when the power is in and you lift the tail, you have a full view of the runway. The airplane is a little short of rudder area, especially the -3s with their big fins, so in a hard left crosswind on takeoff, it isn't unusual for pilots to use full right rudder and a little brake in the early part of the run to keep it straight.

The old 108 is a sweetheart in almost every way; that's why more than 3,000 are still flying. They are rapidly being rediscovered as wonderful, thoroughly useful old flying machines with character, though, so you'd better get yours while they're still a bargain.

—Budd Davisson

Visit Budd on the Web at airbum.com

and side windows. The hardware package is complete and includes Sullivan linkages and control horns, a pull-pull cable system, hinges, nuts, bolts, a fuel tank and tubing, wing and stabilizer tubes, landing gear, axles, wheels and wheel collars. The 20-page photo-illustrated instruction manual is comprehensive, but a few steps need clarification.

Wing assembly The flap- and aileron-servo bay accommodated my Hitec HS-425BB servos with no modifications. Strings in the wing panels facilitated the routing of the servo wires. Hinge slots cut in the ailerons, flaps and wing's trailing edge accept the provided CA hinges. After I had glued the right aileron into place, I discovered that one of the hinge slots was approximately ⅛ inch out of alignment, but this didn't have any apparent ill effects on flight performance.

The wings are attached to the fuse with an aluminum wing tube and retained by two ¼-20 nylon bolts inside the fuselage. The wings' fit and alignment were perfect and didn't require adjustments. I used the supplied Sullivan clevises to attach the struts between brass straps on the wings and aluminum straps inside the fuselage. To ensure that the wing panels would not be warped by improper tension, I used a Robart incidence meter when I set up the struts.

Tail feathers and fuselage The fin is an integral part of the fuselage, and Carl Goldberg does an excellent job of fairing it in with the covering. The rudder is attached with CA hinges and actuated with pull-pull cables.

The stabilizer halves are attached to the fuselage using two short aluminum tubes and are designed to be removable. My stabilizer tubes had excessive play where they passed through the fuselage. To correct this, I wrapped them with clear plastic tape until I was satisfied that they fit tightly.

Two independent elevator servo bays are near the tail on the outside of the fuselage. My Hitec Optic 6 transmitter's dual elevator function made setting up and adjusting the elevator halves effortless and eliminated the need for a reversing Y-harness. Although this servo arrangement is convenient to install, I had to use a heavy brass spinner and add a pound of lead to the nose to achieve the proper balance.

The engine is mounted on a plywood plate that's bolted to the firewall with six 8-32 bolts. I chose to mount my O.S. 1.20 FS in a horizontal position—not inverted. This allowed me to trim the cowl without having

IN THE AIR

The O.S. 1.20 FS supplies ample power for all scale aerobatics and displays excellent vertical performance. Set up according to the manual, the model handled well on the ground. The rudder was very effective for steering; holding full up-elevator reduced the model's tendency to nose over in rough grass. Its ground handling improved significantly when I moved it onto a paved runway.

CONTROL THROWS

Elevator: ± ¾ in. up & down
Ailerons: ± ½ in. up & down
Rudder: 1½ in. right & left
Flaps: set at maximum and ½ maximum deflection

GENERAL FLIGHT CHARACTERISTICS

>Stability: this model is solid. It handles more like a good sport model than a scale model.

>Tracking: the Stinson's relatively long tail moment combined with a huge vertical fin gives it superior tracking. Only a touch of rudder correction is necessary through takeoffs, vertical up-lines and loops.

>Aerobatics: scale aerobatics are easy and clean. Loops, rolls, stall turns and snaps are well within this model's capabilities. Advanced skills are not required to fly these maneuvers impressively.

>Glide performance: the wing loading is high, and the airfoil is thin. When the power is cut, the model descends quickly. It can be slowed to comfortable landing speeds with the flaps deployed, but it is not a floater.

>Stalls: in a word—excellent. The model has to be taken to a fairly high angle of attack before it stalls sharply or drops a wingtip. The more the flaps are deployed, the slower its stall speed. It isn't a trainer, but considering its wing loading, I was impressed by how forgiving it is.

PILOT DEBRIEFING

This is one of the best flying scale models I have ever owned. Takeoff rolls are short, and climbout is steep. Rudder coordination tightens turns considerably but isn't a necessity to fly the model well. The Stinson doesn't have any quirks or bad habits. Aerobatics are smooth and predictable; proper throttle management and flap deployment are required for smooth touchdowns. The model lands somewhat fast and has a longer rollout than most sport models because of its weight and higher wing loading. Setting the model on the mains and letting the tail settle as speeds bleed off yields the smoothest landings.

It has been said that the right airplane can make you look good, and that certainly holds true with the Stinson; it is a pleasure to fly, and it makes me look like an expert.

to remove its molded air intake, and it also allows easy engine starting.

The two-piece aluminum main landing gear passes through slots on each side of the fuselage and is bolted to a thick internal plywood plate. The fiberglass wheel pants have plywood plates molded into their inboard and outboard sides and are very sturdy. I had to use a motorized cutoff wheel to shorten the axles slightly so that the pants fit snugly against the gear.

The Stinson 108's side windows and windshield fit into place perfectly. The trailing edge of the top plastic hatch is bolted into place with four 4-40 bolts. I decided to screw the front of the hatch to the cabin with three small wood screws instead of attaching it with clear plastic tape, as suggested in the manual. This allows the hatch to be completely removed for easy access to the radio gear, and it eliminates any possibility of its coming off in flight.

GEAR USED

RADIO: Hitec Optic 6, Hitec Supreme 8-channel receiver, 7 Hitec HS-425 BB servos and 1 Hitec 325 HB servo

ENGINE: O.S. 1.20 FS

PROP: APC 16x6

FUEL: Wildcat 2- & 4-Cycle

FINAL STEPS

I mounted my battery pack under the cowl to reduce the weight required to balance the model. I set my control throws to the manufacturer's specifications. No throws were specified for flap travel, so I set up full flaps for maximum possible deflection and half flaps to split the difference equally between a full- and a no-flap setting.

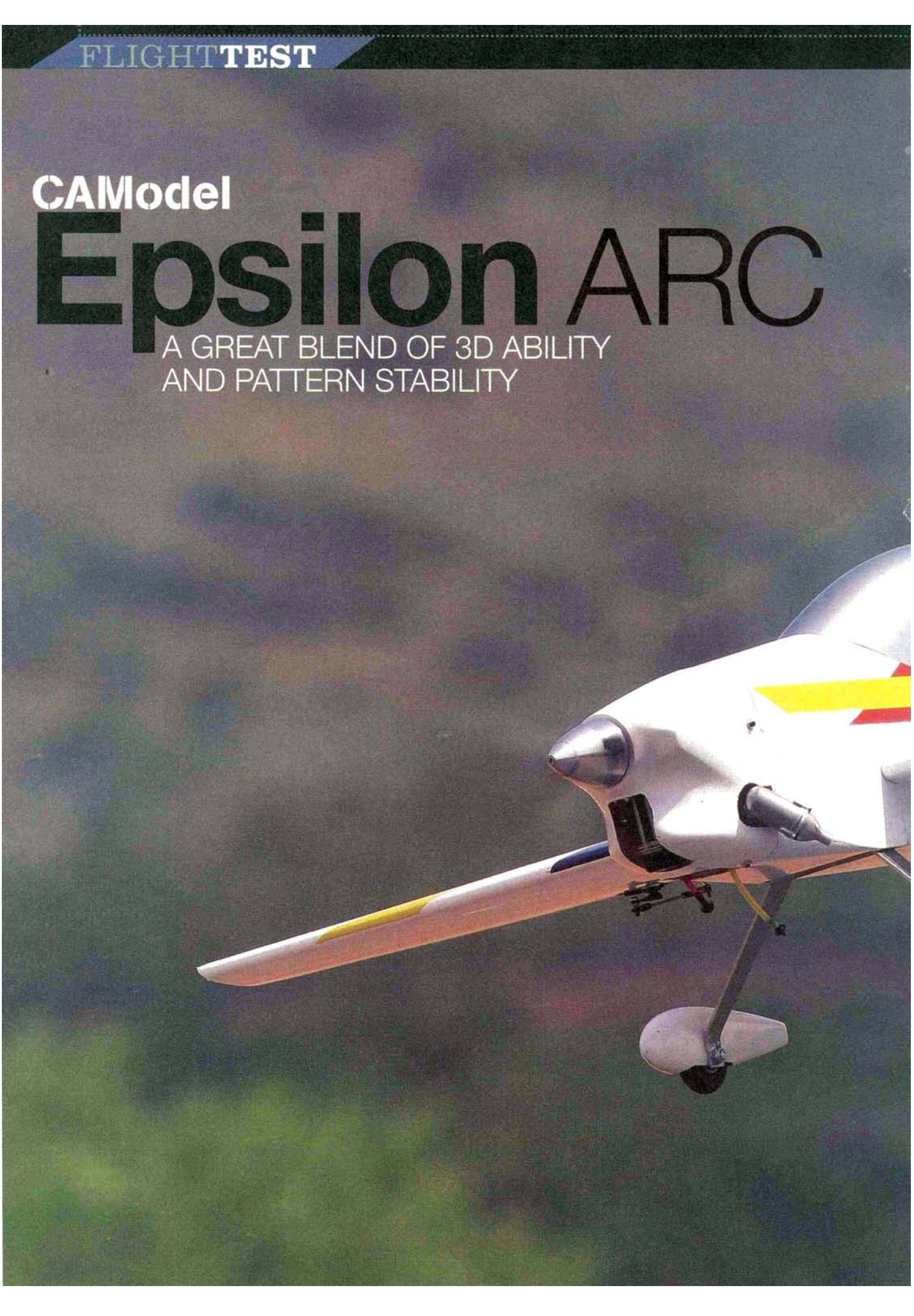
SUMMING UP

Carl Goldberg's Stinson 108 can be assembled quickly and looks fantastic. Its flight performance is rock-solid, and it can easily be flown by an intermediate pilot. Its high-quality components and scale appearance make it an excellent choice for anyone who's looking for a unique, giant-scale ARF.

See the Source Guide on page 151 for manufacturers' contact information.

CAModel Epsilon ARC

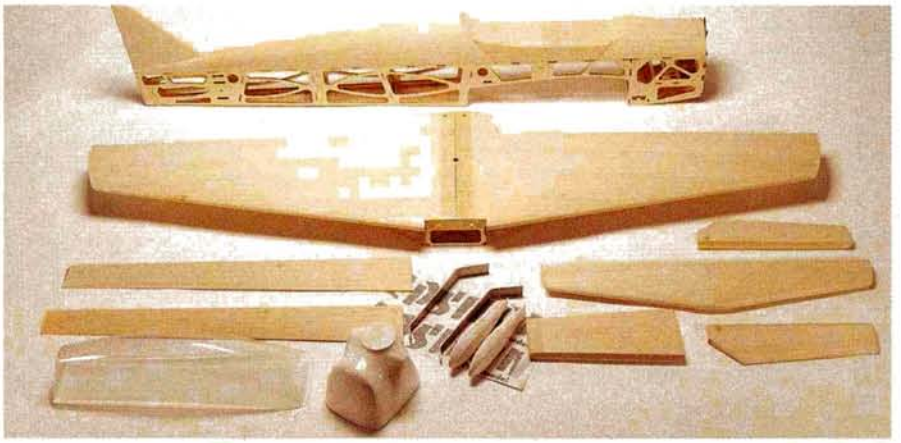
A GREAT BLEND OF 3D ABILITY AND PATTERN STABILITY



BY JET THOMPSON > PHOTOS BY JOHN REID

"As expected, the EPSILON IS A FANTASTIC FLYING MODEL."

CAMODEL HAS A REPUTATION FOR DESIGNING AND producing outstanding model airplanes, and the Epsilon is one more. With the Epsilon, CAModel built on the success of the Widebody 60—the Epsilon's predecessor. The company accomplished this by tweaking the shape of the fuselage for better knife-edge performance and changing the airfoil for more precise maneuvering. Construction is still simple enough for relatively new builders. When I was offered a chance to review the Epsilon, I jumped at it.



SPECIFICATIONS

MODEL: Epsilon ARC
MANUFACTURER: CAModel
DISTRIBUTOR: Aeroworks
TYPE: 3D/pattern
WINGSPAN: 63 in.
WING AREA: 726.5 sq. in.
LENGTH: 65 in.
WEIGHT: 7.6 lb.
WING LOADING: 24 oz./sq. ft.
ENGINE REQ'D: .60 to .90 2-stroke
RADIO REQ'D: 4-channel w/5 servos
PRICE: $299.95

COMMENTS

The Epsilon is a high-quality model that flies very well. I would have liked a manual, but the online instructions got me through the assembly just fine.

HIGHLIGHTS

- Very well constructed of high-quality wood
- Easy to assemble
- Large control surfaces for great 3D performance

THE KIT

Inside the box, I found a beautifully constructed, almost-ready-to-cover (ARC) airframe with airfoiled flying surfaces, a very nice gelcoated white fiberglass cowl and wheel pants, aluminum landing gear and a clear plastic canopy. CAModel does not include any hardware with the kit, and that was OK with me because I have my own hardware preferences. There isn't a printed instruction manual, but you can visit CAModel's website (camodel.com.ar) and print the last few pages of the kit-version Epsilon's manual to use as a guide for the ARC version. If you've already built a few ARFs, you won't have any trouble with this plane.

ASSEMBLY NOTES

Generally, when I build an ARC model, I like to take advantage of the bare airframe and install the hardware before I cover the model. I used Robart Hinge Points because of their easy installation and smooth operation. The fuselage has holes cut in it for the installation of a pull-pull cable system for the elevators, but I decided to install an MK Products bellcrank system to actuate the elevators so I can tweak each elevator half independently while using a single servo. The rudder uses a pull-pull system for positive control.

Wing The balsa-sheeted foam wing is a one-piece assembly, and the ailerons are double-beveled for the extreme control deflection required for 3D maneuvers. The belly pan is already installed, and there are cutouts for the aileron servos and tunnels in the wing for the servo leads; servos of standard size fit perfectly. The ailerons have installed hardwood dowels that are the mounting points for the control horns. I used Du-Bro control horns and five Robart Hinge Points on each aileron.

The wing is held on the fuselage with two ¼x20 nylon bolts that go through the rear of the belly pan and the wing and into a plate in the fuselage. The front of the wing is held in place with two dowels. CAModel has drilled bolt holes in the plate, and they match up with the holes in the wing.

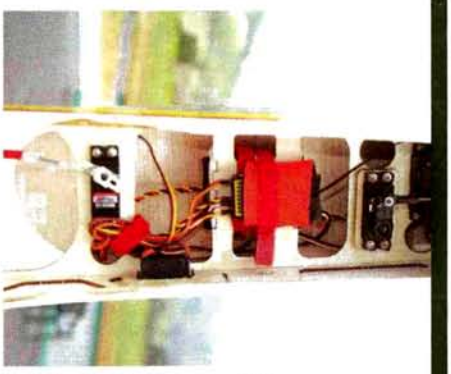
After I had test-fit the hardware, I removed it and covered the wing and ailerons with white MonoKote; I added the trim scheme later.

Tail feathers Like the wing, the horizontal stabilizer is made of sheeted foam and has double-beveled control surfaces and hardwood mounting points for the control horns. MK Products' ball-bearing dual coupler provides a very tight linkage that simplifies elevator setup. I mounted the bellcrank in the rear of the fuselage, being careful to ensure that its location would allow full elevator travel. I connected the bellcrank to the servo with a carbon-fiber rod and used 4-40 ball links at each end for slop-free control.

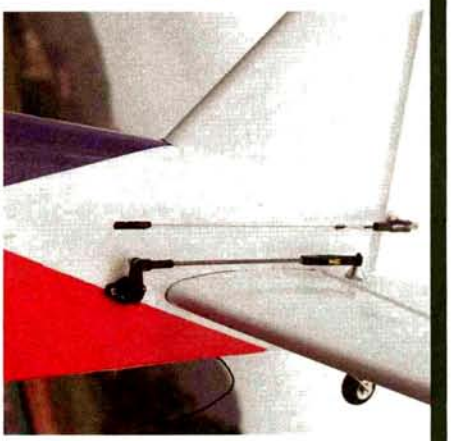
For the rudder, I used Du-Bro's 4-40 pull-pull system; it has always worked well for me; again, I used ball links for a slop-free control system. I installed a Northern Model Products tailwheel setup that protects the rudder and its servo from shock. I needed to install a hard point in the bottom of the rudder for it; I drilled a ½-inch-deep, 5/16-inch-diameter hole in the bottom of the rudder. I then epoxied a piece of dowel into the hole to act as a tiller-arm anchor point.

Fuselage The fuselage is built primarily of lite-ply, and its open structure is very light. The turtle deck is formed of foam and sheeted with balsa. The kit comes with a clear canopy, and a pilot and instrument panel can be installed. I painted the inside of the canopy silver, though, because I didn't want to detail the cockpit interior. The rudder and elevator servos are mounted on a plate that's just below the wing mount. The elevator servo is elevated to ensure that it doesn't interfere with the rudder system.

I secured the cowl to the fuselage with 4-40 hex-head bolts and blind nuts. The landing gear comes drilled for mounting on the fuselage, and I used 6-32 bolts and blind nuts to hold it in place. The landing-gear plate is recessed in a box in front of the wing, and it was a bit difficult to access it with a covering



Radio installation is neat and tidy.



The MK Products dual-elevator coupler is slop-free and operates smoothly.

IN THE AIR

With the YS 1.10FZ in the nose, the center of gravity came out exactly between the recommended 3D and IMAC balance points. The APC 17x6 prop delivers excellent speed and provides good down-line braking power.

CONTROL THROWS

Elevator: ± 1.5 in. (high); expo: 50%; ± 0.75 in. (low); expo: 40%
Aileron: ± 1.25 in. (high); expo: 65%; ± 0.5 in. (low); expo: 50%
Rudder: ± 2 in. (high); expo: 40%; ± 1 in. (low); expo: 30%

GENERAL FLIGHT CHARACTERISTICS

Stability: the Epsilon exhibits outstanding stability at speed, and it likes to fly really fast.

Tracking: this is truly a point-and-go type of airplane. When properly trimmed, it flies very true.

Aerobatics: the Epsilon is a purpose-built aerobat and is true to its nature. It is stable at high speeds and equally agile at slow 3D speeds.

Glide performance: the model glides fairly well, but it does get a bit twitchy at slow stall speeds.

Stalls: stalls are controllable, and the Epsilon will go wherever you want, but if you get it too deeply into a stall and overcorrect, it will snap.

PILOT DEBRIEFING

The Epsilon looks as if it wants to fly even when it's sitting on my workbench. The YS engine and APC prop combination makes fairly high speeds at medium throttle settings, and this is carried through to unlimited vertical climbs.

For 3D maneuvering, there is plenty of power to yank the model out of a hover and climb out at an impressive speed. With spoilerons mixed in, maneuvers such as harriers and elevators are moderately stable, but I was careful not use too much rudder for steering. Knife-edge performance is stellar, and I did good knife-edge loops on the second flight.

Pattern performance is also excellent. Rolls are very axial with 6 percent aileron differential (more up-travel than down), and in stall turns, it looks as if its wingtip is nailed to a cloud. The engine and prop used provide awesome up- and down-line performance. With the CG moved forward just a bit, down lines don't require any elevator corrections. Snaps and spins are precise and smooth, and the Epsilon stops rotating on command. I just love wringing it out!

iron, so I just fuelproofed it with some epoxy thinned with alcohol. I gave the firewall the same fuelproofing treatment.

Power system For motivation, I use my all-time favorite engine, the YS 1.10FZ. This is an extremely smooth running and powerful engine that has superior power-to-weight characteristics. To position the engine on the firewall, I first mounted it on the engine mount so that the thrust washer was 5.1 inches from the back of the mount. I then positioned the engine on the firewall and installed the cowl over it. With the cowl in place, I positioned the engine assembly so that its thrust washer was centered in the cowl opening, and I marked the positions of the engine-mount holes. I used 8-32 bolts and blind nuts to attach the engine mount to the firewall.

I installed a 10-ounce fuel tank just behind the firewall and secured it using Velcro®, straps and foam-rubber pads. I routed the fuel lines through the firewall, and since the engine uses a pressurized fuel system, I added a third line for filling and emptying the tank. I can access the fill and pressure lines through a vent in the bottom of the cowl.

Radio installation and final assembly I'm a big fan of digital servos, so I used Hitec 5625s for the ailerons, a Hitec 5925 for the elevators and a Hitec 5645 for the rudder. These servos provide the torque that I need for extreme deflections and the holding power for precision aerobatics.

With all the servos and hardware installed and working properly, I balanced the plane at 35 percent of the mean chord. I then removed most of the hardware and covered the plane. I used a simple trim scheme that really looks good in the air.

GEAR USED

RADIO: JR 10X transmitter, 2 Hitec HS-5625MG servos (ailerons), Hitec HS-5925MG servo (elevator), Hitec HS-5645MG servo (rudder), Hitec HS-425BB (throttle)

ENGINE: YS 1.10FZ

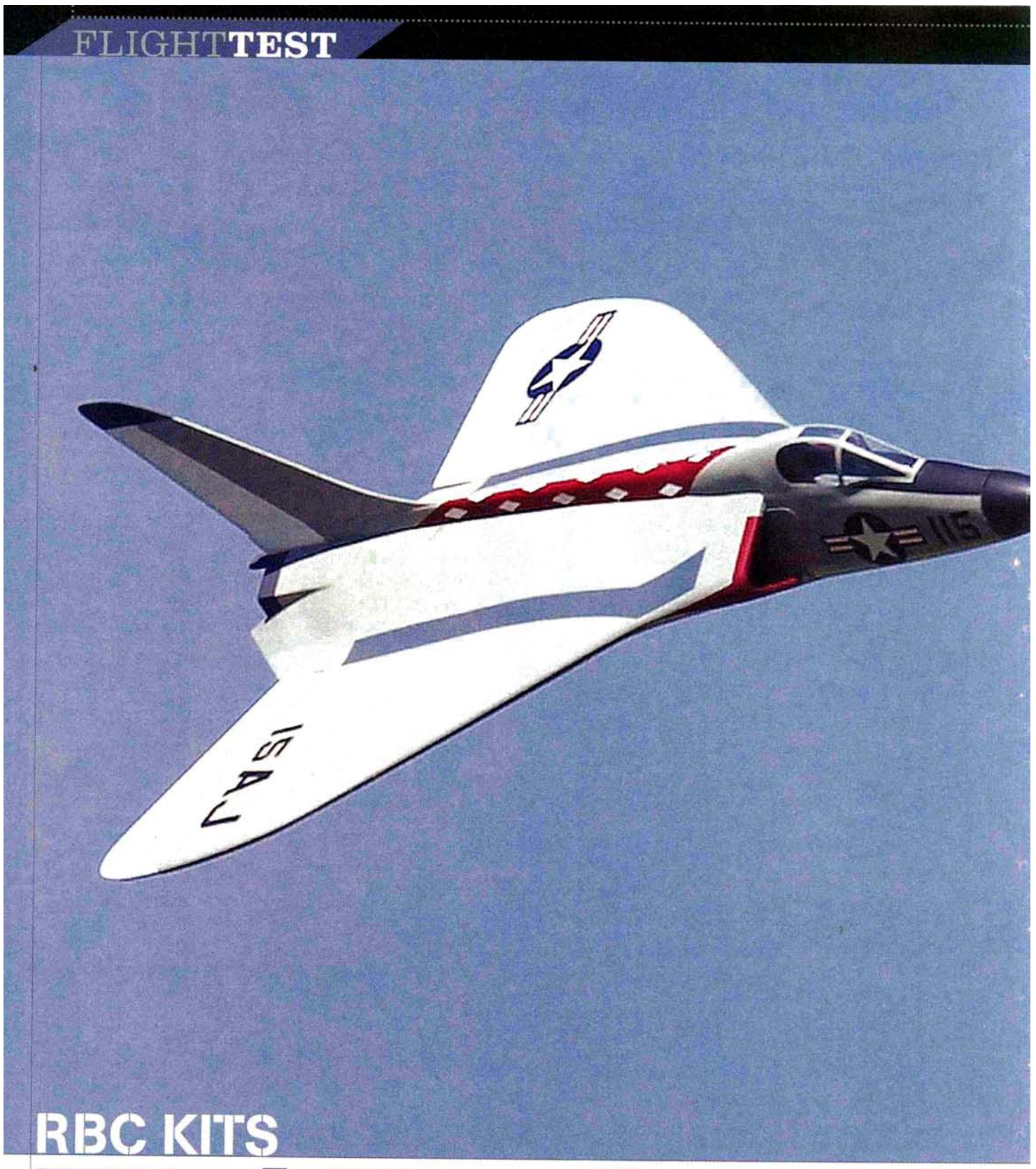
FUEL: Powermaster 20/20

PROP: APC 17x6

BUILDERS' THOUGHTS

As expected, the Epsilon is a fantastic flying model, and the ARC format makes it quick and easy to assemble. I like the fact that hardware is not supplied because I used what I prefer. When this flying season is over, another kit from CAModel will definitely be on my workbench!

See the Source Guide on page 151 for manufacturers' contact information.



RBC KITS

F4D SKY

AN IMPRESSIVE ELECTRIC DUCTED-FAN JET

BY JIM RYAN > PHOTOS BY JOHN KAUK & JIM RYAN

> "If you're in the market for an EDF JET ... THIS IS A VERY GOOD CHOICE."

RAY

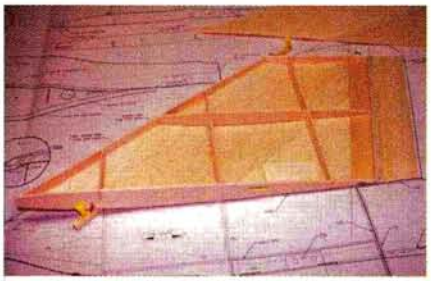
I'VE ALWAYS WANTED AN ELECTRIC ducted-fan model (EDF). High-revving electric motors do well in ducted-fan installations, and their low cost and simplicity remove some traditional barriers to model jets. The question was which jet to build.

As soon as I found out that RBC Kits had released a kit of the Douglas F4D-1 Skyray, I knew I had found my project. The "Ford," as its pilots called it, was one of the great jet interceptors of the 1950s. It was the first true supersonic carrier-based fighter—a hot-rod that could go from brake release to 30,000 feet in 90 seconds. Yep; a Skyray was just the ticket.

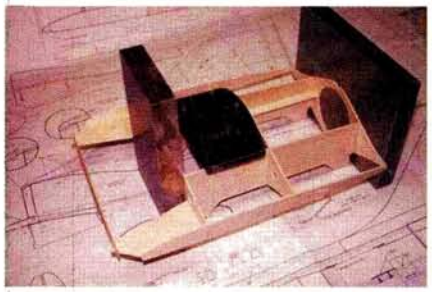
PLANS AND PACKAGING

The Skyray comes with CAD-drawn plans that include diagrams of the CNC router-cut wood sheets. Before beginning assembly, I recommend that you mark every part to avoid confusion later. Construction notes are brief, and the English translation is vague in spots, but I didn't have any problems following along. The kit also includes a sheet of color construction photos and 3D CAD renderings that show the airframe assembly.

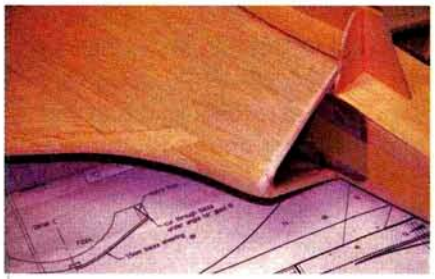
>Wings The wings are built inverted on the building board with the ribs and formers assembled directly on the top wing skins. Already, I was impressed by the tight and accurate fit of the parts, and I was able to complete both wing panels in a single evening.



The wing panels are built upside-down on the building board using a square balsa stick to ensure a straight assembly.



The center section is framed up flat on the building board. The "feet" on the side frames make it easy to keep the structure absolutely straight.



The inlet frames are built around the plastic ducting using the ducts themselves to help with alignment. Proper inlet geometry is crucial.

Fuselage I was a little anxious about the fuselage construction. On a ducted-fan model, the formers have to make provision for the internal ducting. This makes warp-free frame-up more challenging, and the Skyray's blended-body airframe appeared to be tough to build. I could hardly have been more wrong. The fuselage side-frame tabs allow the entire fuselage to be framed up and sheeted flat on the building board. I added ¼-inch-square balsa "feet" to make the framework easier to pin to the board. The tabs and slots allow assemblies to be fitted together and checked for squareness before they're glued. With the main frame assembled, next up was the "center body" that sits between the split intake ducts. This simple framework is sheeted with 0.4mm cross-grain plywood to make a nice, smooth contour.

All the vacuum-formed parts are made of molded, clear PETG and have trim lines molded in. The duct halves are temporarily taped together and maneuvered into place. There's some trimming to get the ducts exactly right, and this was the most tedious part of the assembly, but it's very important.

The instructions say to cut F14 (the front plywood frame that supports the ducts) so that it can be slipped over the ducts. I didn't find this necessary. I fitted F14 into place on the fuselage frame and then partly flattened the ducting so that it would slip through F14. I then slipped the center body in on its side and pushed it back as far as it would go before rotating it upright and pulling it forward into its final position. After installing the ducting and the center body, I built the frames for the intakes. The tapered efflux tube is cut out of 0.18mm plastic sheet following a pattern on the plans. I left a tab down one edge so I could overlap the tube. This also made it easier to fit the tube to the plywood ring used to couple the efflux tube to the fan housing. (Note: as part of my brushless-power upgrade, I moved the fan unit 1¾ inches back by installing a plywood "extender" tube in front of the fan.

The forward fuselage section is a simple balsa box with triangle stock at the corners and a carved balsa nose block. Simply carve it to shape and trial-fit it into place, but don't glue it until later.

Don't forget to install a speed-control lead in the fan compartment before you sheet the fuselage. With the planking's compound curvature, I wondered whether I'd have difficulty fitting the sheeting into place. This turned out to be no problem at all. The tail-cone assembly is built up from a CNC-cut balsa frame and covered with two vacuum-formed PETG shells. To make it fit the fuselage as accurately as possible, I pinned T3 to the rear of the fuselage and block and sanded it so that it was 0.040 inch narrower from top to bottom. Take your time with the tail-cone shells, and make sure that you understand exactly how the parts should fit before you trim them to size. Having finished and trial-fit it, I laid the tail cone aside until after I had glassed the main airframe.

FINAL ASSEMBLY

Reattach the fuselage to the building board so that it is absolutely level. Use the alignment tabs, and pin the wing panels into place so that they, too, are dead level. I used wooden supports at the wingtips to make sure that everything was square. Once I was happy with the arrangement, I glued the

SPECIFICATIONS

MODEL: Douglas F4D-1 Skyray
TYPE: 1/16-scale EDF jet
MANUFACTURER: RBC Kits
WINGSPAN: 25.6 in.
WING AREA: 310 sq. in.
WEIGHT: 42 oz.
OVERALL LENGTH: 34 in.
WING LOADING: 19 oz./sq. ft.
POWER REQ'D: WeMoTec MiniFan 480 with an HET-RC Typhoon EDF-2W motor
RADIO REQ'D: 3-channel (elevons and speed control)
PRICE: $119

BRUSHLESS UPGRADE

I flew for three seasons with the Skyray's original brushed Plettenberg powerplant. It proved to be efficient and trouble-free for more than 80 flights. But now, electric ducted-fan (EDF) systems have greatly improved in performance. High-revving brushless motors have pushed fan rpm to new levels for truly jet-like performance, and lighter, high-energy cells have reduced weight and extended duration—a rare win/win scenario.

MOTOR UPGRADE

The motor had to be compatible with the MiniFan 480 fan unit, so I consulted EDF guru Chris True. He recommended the Mega 16/15/3 brushless motor on 12 cells.

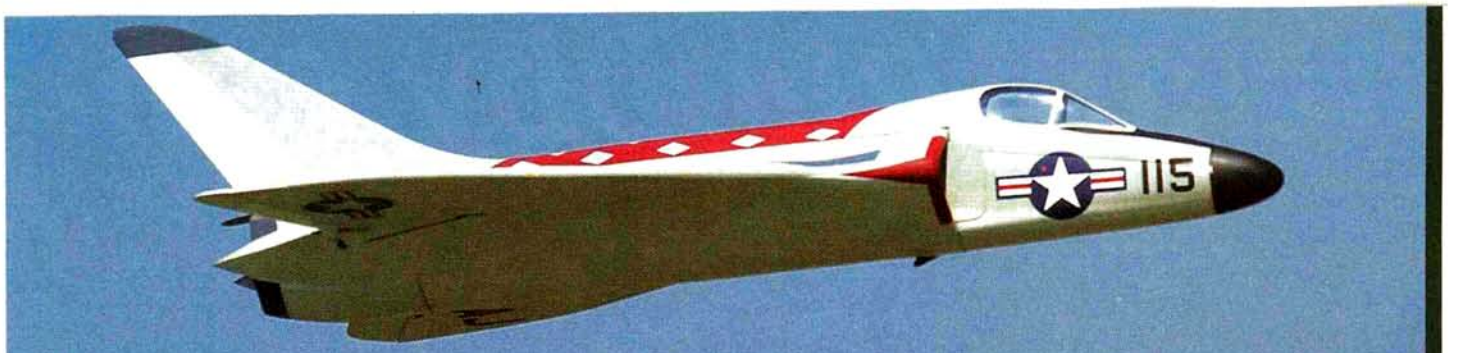
The Skyray has only 2 servos, so I used a BEC instead of a separate receiver battery. Patrick Del Castillo at Castle Creations advised a Phoenix 45 controller because it has plenty of "headroom" and a robust BEC to handle 12 cells. Check with the manufacturer before you try such a setup.

BATTERY UPGRADE

The battery mass must be kept aft, so, lighter cells are attractive. The manufacturer recommends that you use a 3200mAh 3S1P Li-poly pack. I used 1950-FAUP NiMH cells, which are also a very good choice because they're compact enough to fit in the rear of the battery compartment, and they can handle discharge rates of 40 amps.

RESULTS

The original power system produced 220 watts. The new system produces nearly 400 watts, and the performance made a huge leap forward. Overall, this power upgrade has given new life to a favorite model, and I look forward to flying my Skyray for years.



IN THE AIR

I had an unusually long time in which to evaluate the Skyray. Throughout four seasons of flying, it has proven reliable and reasonably durable. It has also remained one of my greatest sources of enjoyment at the field.

CONTROL THROWS

Elevon pitch: ± 3/8 in.; expo 25%
Elevon roll: ± 3/16 in.; expo 25%
Rudder: not applicable

GENERAL FLIGHT CHARACTERISTICS

>Stability: though in no way "twitchy," the Skyray is a fast and neutrally stable model. Do not expect it to fly itself.

>Tracking: the Skyray goes right where you point it. With its clean, delta planform, it tracks well even in blustery conditions.

>Aerobatics: its vertical performance is fantastic. It will do vertical rolls until it's almost out of sight. Gigantic Cuban-8s are my favorite maneuvers with this plane, and it's also very stable in sustained inverted flight. **>Glide performance.** The Skyray glides very well as long as you keep the speed up. Bear in mind that with a delta wing, drag increases quickly at high angles of attack, so don't expect to glide around at low speed. But in the glide down to landing, the model handles very nicely.

>Stalls: the model doesn't display any bad habits near the stall. Even balanced a bit aft of the recommended CG, it will simply drop its nose without any tendency to drop a wing. Just release the backpressure, and you're flying again. Like any delta, stall recovery does take a little more altitude than usual.

PILOT DEBRIEFING

Bungee launching an electric jet is always exciting, but the Skyray has been reliable on flight after flight. For the catapult bungee, I use 16 feet of ¼-inch-i.d. tubing and stretch it to the point at which strong resistance is encountered. My assistant holds the jet on the flat of his hand with the nose pointing upwards about 10 degrees. With the delta planform, I recommend that you hold full up during the launch and then ease off the up-elevon as the jet clears the bungee. By then, it will be climbing fast.

The model is very fast and has an incredibly quick roll rate, but overall, the little jet doesn't have any bad habits. It goes right where you point it, and the vertical is fantastic.

With brushless power, the wide speed envelope takes getting used to. The Skyray is so fast at full power that you don't realize how slowly it can land. I now fly a military-style landing pattern: I make a low pass along the runway while cutting back to ½ throttle and then do a high-G turn to the downwind leg. This bleeds off lots of speed and looks impressive! I cut power entirely on base leg and then turn onto final. As I slowly bring the nose up, the speed bleeds off quickly, and the Skyray settles in nicely at a fairly high angle of attack. Actually, it's one of the easiest small jets to land that I've seen.

wings to the fuselage.

With the wings in place, I glued in the balsa blocks that form the transition from the wing leading edges to the sides of the intakes and then carved and sanded them to shape. Sand the intake lips to the correct elliptical shape (detailed on the plans). Inlet geometry is crucial to proper ducted-fan performance, so take your time.

GEAR USED

MOTOR: Mega 16/15/3

RADIO: Multiplex Evo-12 transmitter, Hitec Slim 7 receiver, Hitec HS-81 servos

BATTERIES: 12, 1950mAh FAUP NiMH cells

I finished the main subassemblies with fiberglass before completing the final assembly. I then reattached the airframe to the building board and glued the nose section into place. Glue the tail section into place at this time, too. To make the airframe easier to finish, I waited until this point to attach the dorsal spine and the vertical fin, to cut the elevons free of the wing, cut the bungee-hook slot and epoxy the hook into place.

The fan-unit installation is described in detail, and the kit includes a movable support ring for adjusting the thrust vector of the efflux tube if needed. I originally powered the Skyray with a Plettenberg HP-200-20-6 brushed motor and 10 cells, but I now fly it with the brushless system detailed in the "Brushless Upgrade" sidebar. I installed a Deans base-loaded antenna in the nose—far from the motor and wiring—and I positioned the battery at the rear of the compartment to obtain the specified CG.

FINISHING

I used Testors' Model Master enamel to duplicate the mid-1950s Navy VF-102 scheme of the U.S.S. *Forrestal*. The color scheme looks great in the air, and the white elevons are a nice aid to orientation.

COMMENTS

Though some of the wording in the instructions is vague, the Skyray is a well-thought-out design. It features CNC-cut balsa and ply parts and vacuum-formed PETG components.

HIGHLIGHTS

>Accurate CNC-cut wood
>3D CAD assembly drawings
>Impressive performance

SUMMARY

The RBC Kits F4D-1 Skyray is a truly ingenious design. I did not expect such a complex airframe to be so easy to build, but the kit's 3D CAD design really does the job. Total project time was about three weeks. If you're in the market for an EDF jet with solid performance, this is a very good choice. ✚

See the Source Guide on page 151 for manufacturers' contact information.

"If you have the urge for 3D flying, THE MATRIX 40 IS THE PLANE YOU'LL WANT TO GET."

BY ROBERT REID > PHOTOS BY JOHN REID

CARL GOLDBERG PRODUCTS

MATRIX 40 EXTREME 3-D ARF

NITRO-POWERED 3D PERFORMANCE

THE 3D FLYING CRAZE HAS EXPANDED ACROSS THE COUNTRY, and a wide variety of 3D planes—mainly electric versions—is available. But for a guy like me who has long been involved with glow-powered aircraft, it would take a considerable investment to join this movement. Fortunately, Carl Goldberg Products has come out with a 3D model that's designed for a glow engine. The new Matrix 40 Extreme 3-D gives pilots the opportunity to perform 3D maneuvers while still enjoying the sounds and smell of a glow-powered aircraft.

Carl Goldberg Products has been around for a long time, and over the years, I have built a few of its kits. I have always been impressed by these products' quality, so when I got the opportunity to review a CGP ARF, I was curious to see whether its quality would match that of the company's kits.

CARL GOLDBERG PRODUCTS MATRIX 40 EXTREME 3-D ARF

SPECIFICATIONS

MODEL: Matrix 40 Extreme 3-D ARF
MANUFACTURER: Carl Goldberg Products
TYPE: 3D aerobatic ARF
WINGSPAN: 55.25 in.
WING AREA: 662 sq. in.
WEIGHT: 5.5 lb.
WING LOADING: 19.1 oz./sq. ft.
LENGTH: 58 in.
ENGINE REQ'D: .40 to .50 2-stroke or .50 to .72 4-stroke
RADIO REQ'D: 4-channel with 5 servos (throttle, rudder, elevator, 2 ailerons)
PRICE: $109.99

COMMENTS

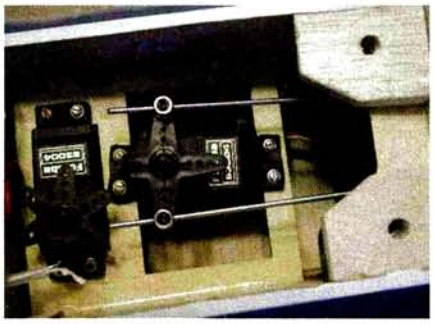
The Matrix 40 Extreme 3-D is a very capable 3D ARF. The kit includes all hardware needed with excellent instructions. Sunday fliers as well as experienced pilots who want to push the envelope of their flight abilities will enjoy the Matrix 40.

HIGHLIGHTS

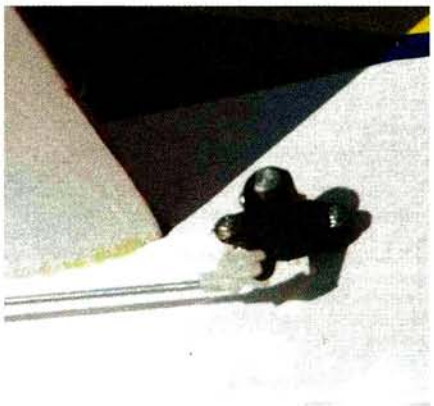
- Very well-designed kit
- Clearly written and well-illustrated instruction manual
- Great flight characteristics

OPENING THE BOX

Inside the box, I found everything packed neatly with foam packing material that kept all parts free of nicks and dings. Included in the ARF is an 18-page manual with numerous photos and detailed instructions showing every step of assembly. There is a complete hardware package along with wheels, a gas tank, a fiberglass cowl and wheel pants. The fuselage, wing, stabilizer, rudder and elevator are covered with a good-quality film covering. One of the first things I did was to check the covering for wrinkles so I could remove them with a heat iron. This model was wrinkle-free, however; one less thing for me to do!



With only the throttle and elevator servos inside the fuselage, there's plenty of room to work.



The elevator-bellcrank setup allows one servo to operate two independent elevator-control surfaces precisely.

ASSEMBLY

I began the assembly by removing the covering from the stabilizer at the rear of the fuselage. After inserting the stabilizer into the fuselage slot, I used a ruler to center the stabilizer and then measured from the tip to the back of the fuselage wing cutout. When I was satisfied with the alignment, I drew a line on the top and bottom of the stabilizer. After I removed the stabilizer, I cut away its covering to expose the bare wood. I bolted the wing onto the fuselage, then reinserted the stabilizer and checked its alignment with the wing. I then made any necessary corrections, mixed up some 30-minute epoxy and glued the stabilizer to the fuselage. I used rubbing alcohol to clean up the extra epoxy that oozed from the joint. While waiting for the epoxy to dry, I mounted the control horns on the elevator. These steps are explained thoroughly in the instruction book.

Tailwheel A tailwheel and bracket are included in the kit along with detailed instructions showing the tailwheel's installation. According to the manufacturer, the tailwheel will work better unconnected because of the large rudder and the significant amount of throw. At this time, I attached the rudder and elevator to the stabilizer and fin using the supplied E-Z hinges. The rudder horn is 5 inches up from the bottom of the rudder; this seems strange because the pushrod is at a 45-degree angle from the servo, but this angle is needed to clear the elevator movement.

Elevator bellcrank Carl Goldberg has come up with a variation for the elevator connection; a unique push-pull bellcrank system is used. On the fuselage side, just in front of the stabilizer, there is a small hole on each side, and on the bottom of the fuselage below this, there is a small hatch cover. This removable cover allows access to the inside of the plane. I inserted a plastic collar in the hole on the fuselage side and then pushed an aluminum rod through a plastic tiller arm (inside the fuselage) and out the other side. Two threaded rods are attached to the inside tiller arm. Outside the fuselage, two control arms (one on each side) are attached to the aluminum rod with screws. A pushrod is connected to each arm and elevator; this creates a positive direct drive on both elevators using only one servo. When I first looked at this setup, I thought it would be difficult to install, but I found it to be surprisingly easy. The elevator servo is installed in the fuselage servo tray.

The rudder pushrod is set at a nearly 45-degree angle from the servo so the elevator-control surfaces can clear it.

IN THE AIR

All flights were flown using the Saito FA72 GK, Powermaster 15% nitro and Top Flite 11x7¾ prop. All the components performed faultlessly. The Saito was mounted inverted. For some engines, this poses a problem with starting, but the Saito started easily and ran great in that position.

CONTROL THROWS

Elevator: ± ½ in. (low); ± 1¼ in. (high)
Ailerons: ± ⅜ in. (low); ± 1¼ in. (high)
Rudder: +1½/-2 in.

GENERAL FLIGHT CHARACTERISTICS

Stability: at high and low speeds, the Matrix 40's performance is extremely stable throughout all maneuvers.
Control response: the Matrix 40's large control surfaces make for a very quick response, even at low speeds. The light construction also contributes to its fast control response.
Tracking: this plane tracks very well in the air and locks onto wherever you point it. It's almost as though the plane is inquiring "OK; now what do you want me to do?"
Aerobatics: the Matrix 40 is a 3D aerobatic plane, and as such, it is capable of doing any and all extreme 3D aerobatics.
Glide performance: glide performance is outstanding whether at idle or deadstick. The plane just wants to keep flying,
Stalls: balanced correctly, stalls are very friendly, and with the nose pointed upward, it will just mush along.

PILOT DEBRIEFING

Even with the free-floating tailwheel, the Matrix 40 tracks nice and straight on takeoffs, with very little right-rudder correction needed. The Saito 72 is the perfect engine for this plane; it has more than enough power. In the air on low rates, rolls are crisp and need no rudder input to keep them axial. All standard aerobatics are easy to do on low rates. On high rates, they're a whole different ballgame, and I found the Matrix 40 to be one of the most responsive planes I have flown. With the Matrix 40, you are limited only by your imagination. It excels at maneuvers such as the harrier, torque rolls, waterfalls and elevators. Landings are so easy with this plane that they make you look good. If you have the urge for 3D flying, Carl Goldberg Products' Matrix 40 is the plane you'll want to get.

Rudder I removed the covering from the servo cutout, installed the servo and attached the pushrod to the rudder. Again, the instructions for this step are very clear.

Ailerons I installed the ailerons using CA hinges, removed the covering from the servo cutouts in the wing and installed the servos, the control horns and the pushrods. I used the nylon fishing line inside the cutout to pull the aileron-servo wires to the center of the wing.

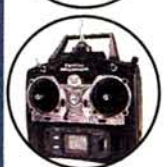
GEAR USED

RADIO: Futaba 6EXA transmitter, Futaba FPR-127DF receiver, 5 Futaba S3004 servos

ENGINE: Saito FA72 Golden Knight

FUEL: Powermaster 15% nitro

PROP: Top Flite 11x7¾



Landing gear The landing gear are held on by four bolts, and the blind nuts are already installed in the fuselage. The wheels supplied are of good quality and are perfect for asphalt or hard-packed surfaces, but if you fly off grass, you'll need larger wheels. The fiberglass wheel pants are of good quality, and they're simple to install. I did, however, have a small problem trying to keep the wheel pants tight; they kept loosening. I decided to drill an extra hole through the landing gear and wheel pants. After connecting them with a screw, I had solved the problem.

Engine mount A nylon engine mount is included; the manual gives very detailed instructions for its layout on the firewall. I clamped the engine to the mount, lined it up on the firewall and then marked the holes. I drilled and bolted the mount to the firewall with the supplied hardware and installed the nylon sleeve and pushrod for the throttle servo. After I installed the engine, I installed the cowl. The manufacturer gives some tips on making the cutouts in the cowl using a piece of cardboard taped to the fuselage. I marked the location of the cutouts on the cardboard for the muffler and then slid the cowl on under the cardboard and transferred the cutout holes to the cowl.

Final assembly The manufacturer's recommended center of gravity (CG) for the Matrix 40 is 5½ inches from the leading edge for the first few flights. It can then be moved backward or forward to suit your flying abilities. I started with the CG at the recommended location, and after a few flights, I moved it back a little. This really matched my type of flying and made the 3D maneuvers easier to perform without affecting the straight-and-level flight performance. Four maneuvers that can easily be performed with the Matrix 40 Extreme 3-D are described in the manual.

WRAP-UP

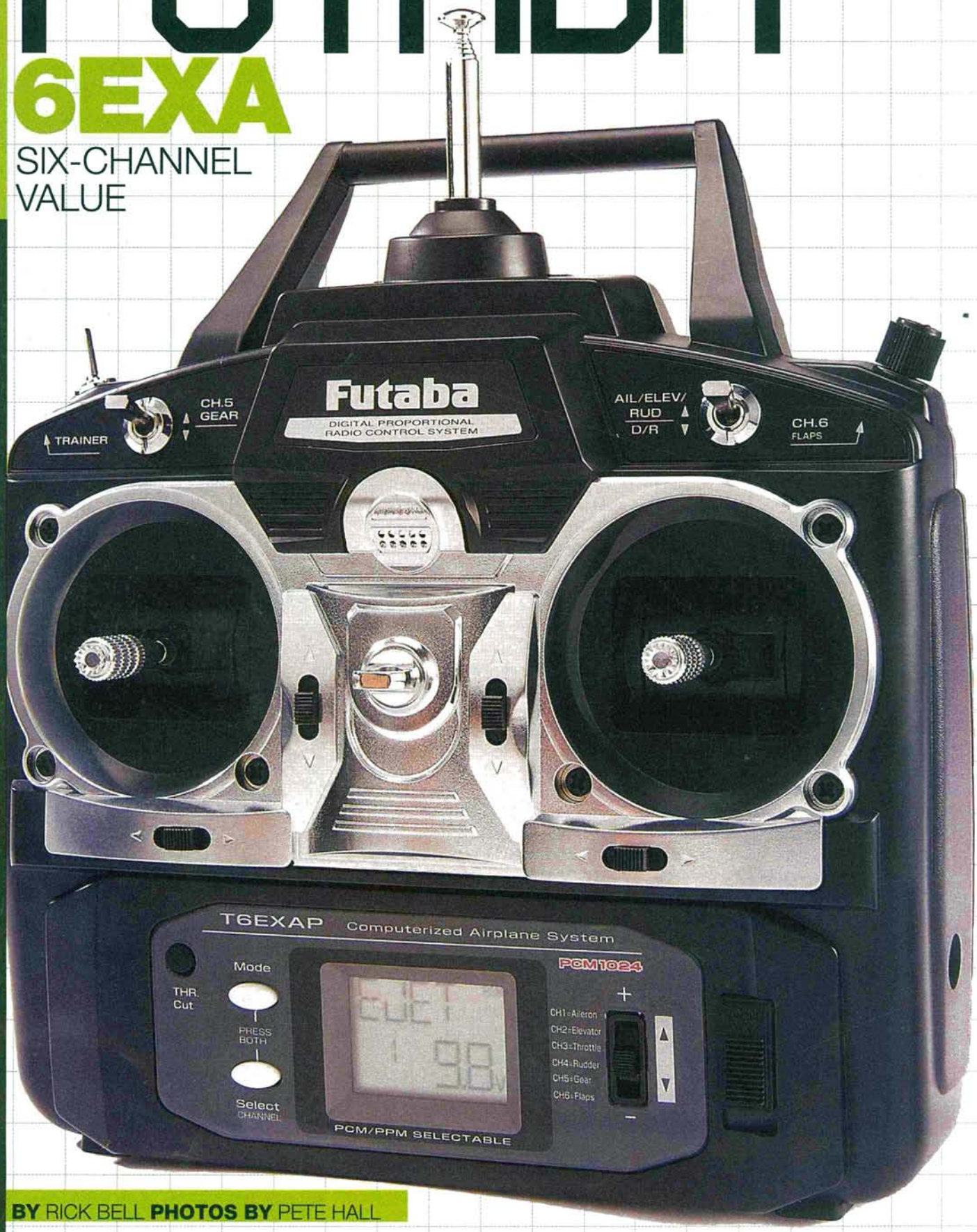
Carl Goldberg Products' new Matrix 40 Extreme 3-D is a particularly easy airplane to assemble, and it offers some unique control setups. As I expected, the quality and performance of this company's kits have carried over to its ARF products. Whether you are an intermediate or an advanced pilot, you'll enjoy the flight characteristics of this plane. The Matrix 40 was a pleasure to build and fly, and I have no doubt that you'll enjoy it as much as I do.

See the Source Guide on page 151 for manufacturers'

FUTABA

6EXA

SIX-CHANNEL VALUE



BY RICK BELL **PHOTOS BY** PETE HALL

THE INNOCUOUS BLACK BOX THAT ALLOWS YOU TO FLY your model so precisely probably has as much, if not more, computing power than anything that has been to the moon. It's a marvel of circuit boards, microprocessors and other gadgets that work flawlessly without any assistance from you (other than charging its batteries).

The latest addition to Futaba's range of 6-channel radios is the 6EXAP—a digital proportional RC aircraft system that has a lot going for it and is an ideal first "computer" radio system. Designed for sport flying, it's intended to make flying your model easier than it would be with a "non-computer" radio. Let's have a look.

SYSTEM OVERVIEW

It's really nice to see manufacturers heading towards simple, easy-to-use computer radios. For a sport system, the 6EXAP has much to offer. It's easy to operate, provides just enough features to satisfy beginners and sport fliers and, best of all, it's affordable. To help keep costs down, Futaba offers the 6EXAP in two versions—airplane and helicopter.

Standard programming features include:

- 6-model memory with 4-character model naming
- Model select/reset
- Modulation (PPM/PCM)
- Dual rates and exponential for aileron, elevator and rudder
- Trim fine-tuning
- One free mixer
- Flaperon
- Flap trim
- V-tail
- Elevon
- Fail-safe (PCM mode only)

The 6EXAP also has servo-reversing and endpoint adjustment (EPA) on all 6 channels. Channel 5 is a non-proportional (on or off) retract channel that could also serve as an electric motor's on/off switch. The sixth channel is a rotary knob for functions such as flaps. Transmitter controls include a throttle-cut button, a trainer switch, a single, dual-rate/exponential switch for aileron, elevator and rudder, digital trims and adjustable stick length.

THE TRANSMITTER

The transmitter has a large carrying handle, and the antenna can be retracted so that it protrudes only about 1½ inches above the top of the case. Control-stick tension isn't adjustable, but the sticks' lengths can be altered easily to suit your preferences.

The radio has digital trims on all 4 channels; there aren't any visible indications of what the trim values are, but when you press a trim lever, a number pops up for a few seconds to show the trim value, and then the normal display reappears. The center of the trim range is "0," and each time you press a lever, its value changes in increments of "4" up to a maximum of "120" on either side of the "0" center. If the increments are too coarse, you can fine-tune the steps in the trim programming. When you set a trim value for a model, it is automatically stored in the transmitter's memory and is not carried over to a different model.

Because it can be difficult to quickly move a digital throttle trim to kill your engine at the end of a flight, Futaba has cleverly added a kill button that's below the throttle-trim lever. You can set the trim lever for a reliable idle and taxiing and shut the engine down with the push of a button. No more fiddling with the throttle trim lever; set it and forget it!

To convey its programming information, the 6EXAP has an easy-to-read liquid-crystal

When you use a digital trim, the screen changes to show the "position" of the trim lever.

Specifications

Manufacturer: Futaba
Distributor: Great Planes Model Distributors

Transmitter
Model: 6EXAP FM
Type: aircraft
Encoder: 6-channel computer system
RF module: built-in, non-removable
Modulation: PPM/PCM
Power source: 600mAh, 9.6V Ni-Cd

Receiver
Model: FP-R127DF
Type: FM 7-channel
Frequency: 72MHz
Weight: 1.5 oz.

Servo
Model: S3151
Type: digital
Torque: 43 oz.-in. at 4.8 volts
Speed: 0.21 sec./60 deg. at 4.8 volts
Size (LxWxH): 1.59x0.79x1.42 in.

Accessories included: switch harness, 4-cell, 600mAh Ni-Cd battery pack, dual-output battery charger, aileron extension cable, servo-mounting hardware, extra servo arms, frequency flag and instruction manual.

Prices
>Airplane
6EXAP FM w/4 S3151 servos, $199.99.
6EXAS Super FM w/3 S3101 servos, $179.99.
6EXAS FM w/4 S3004 servos, $179.99.
>Helicopter
6EXH FM w/4 S3151 servos, $199.99.
6EXH PCM w/4 S3151 servos, $229.99.

Radio highlights

- Digital trims
- 6-model memory
- Easy-to-read display
- Digital servos
- Preprogrammed mixers

This is the screen you see when you turn on the transmitter.

display (LCD) screen. On the left of the screen are two buttons—Mode and Select—and on the right is the Data Input lever. The power switch is on the bottom right corner of the transmitter where it's out of the way.

Along the top of the transmitter case are the trainer switch (left corner) and the rotary knob (right corner). On its left upper face is the channel-5 toggle switch and on the right, the dual/expo switch. I found the transmitter's layout easy to remember, and all the controls are within easy reach.

PROGRAMMING

When you first turn on the transmitter, the model's name, modulation, model number and battery voltage will be displayed on the LCD screen. To access the programming functions, press the Mode and Select buttons simultaneously, and hold them down for 1 second. To return to the Home screen, simultaneously hold down the Mode and Select buttons again.

Once in the program, the Mode button is used to scroll through the menu, and the Select button is used to view the settings within the function. To change data, use the Data Input lever to increase or decrease the value of the item being displayed. The LCD characters are large and easy to see, and the acronyms used are simple to understand.

Every time you access the program, it starts with "MODL" and a flashing number. This is the model-selection screen and the memory currently in use. Use the mode button to scroll to a different function. If you scroll past the function you want, you'll have to scroll through all of the functions until the one you missed comes around again.

The trainer and channel-5 retract switches are on the transmitter's left side.

A single switch controls dual rates for aileron, elevator and rudder.

It's easy to program dual rates to get the exact control response you desire.

EASY PROGRAMMING

If you've never used a computer radio, you'll see that programming the 6EXAP is very intuitive. Here's an example: say you need to reverse the direction of the elevator servo. Hold down the Mode and Select buttons until you enter the program. Next, press the Mode button until "REVR" is shown on the display screen. There, you'll see "NOR" and "REV" with an arrow pointing upwards and a flashing number. This number represents the channel to be reversed, and the arrow indicates whether the channel is normal or reversed. If you don't remember which channel numbers are aileron, elevator, etc., there's a chart that shows that channel 1 is aileron, chan nel 2 is elevator, and so on—right next to the Data Input lever. Press the Select button until the number 2 (elevator) appears. Now press the Data Input lever down once, and the arrow will point downwards; the elevator channel has now been reversed. If you want to go to another function, press the Mode button. If you've finished programming, press the Mode and Select buttons simultaneously to save your changes, and return to the Home screen. All of the 6EXAP's programming functions are this easy to use.

This screenshot shows the servo-reversing function. Programming the 6EXAP is very intuitive.

A neat feature of the system is the Wing Mixing programming. Here, you can choose flaperon (FLPR), flap trim (FLTR), or elevon (ELVN) mixing. Again, each is easy to use, and the manual clearly shows their operation.

Speaking of the manual, it is very informative and, like the programming, easy to understand. Every programming function is explained in the order in which it appears on the screen; this makes it easy to follow the manual. There are also a lot of screen shots that show the programming steps, a glossary of terms and an excellent flow chart.

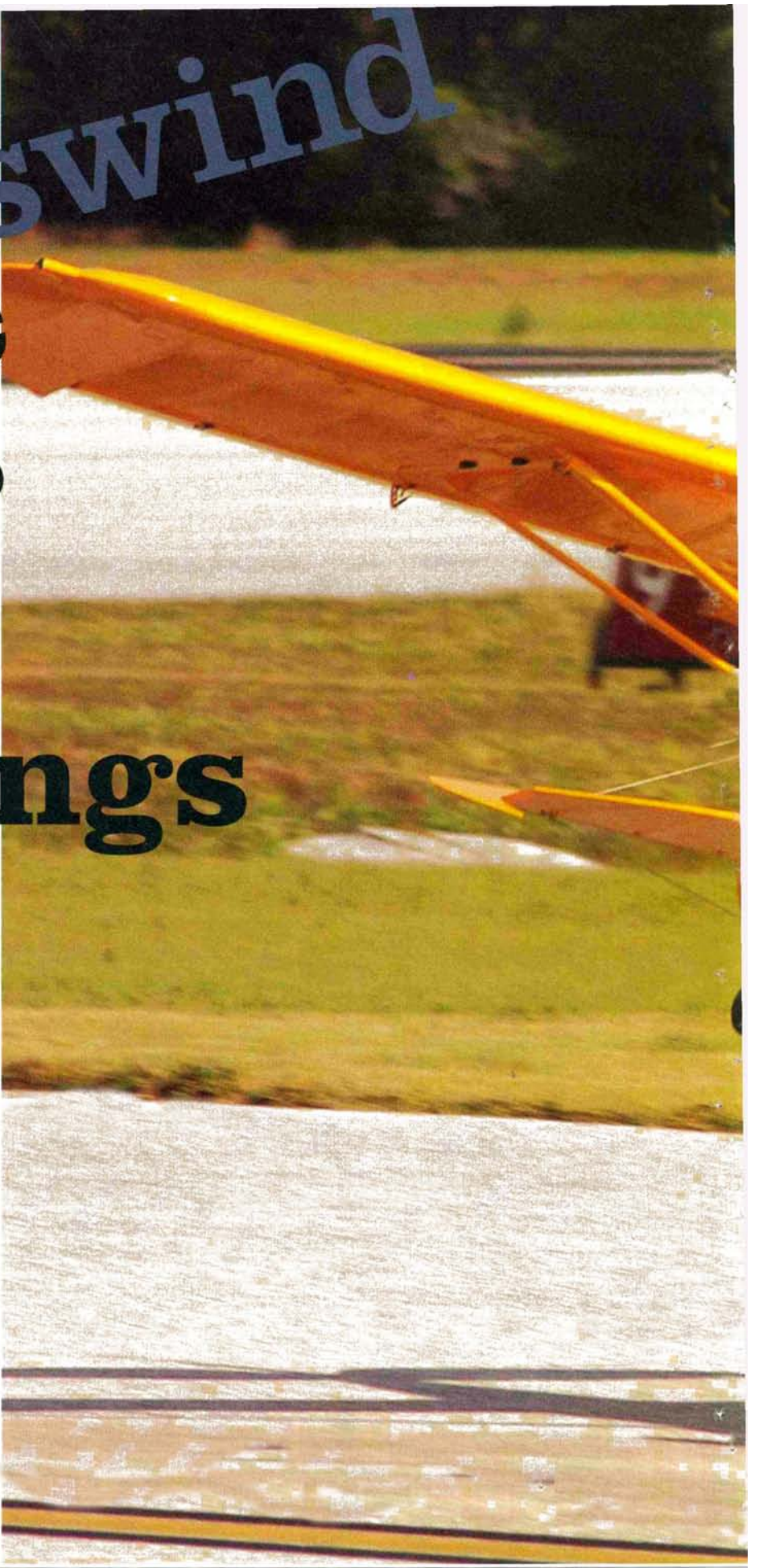
FINAL CALL

The Futaba 6EXAP RC system's features and affordable price make it a very attractive package for any pilot who's interested in computer radios. Add to these its intuitive programming and reliable performance, and you have a winning combination.

See the Source Guide on page 151 for manufacturers' contact information.

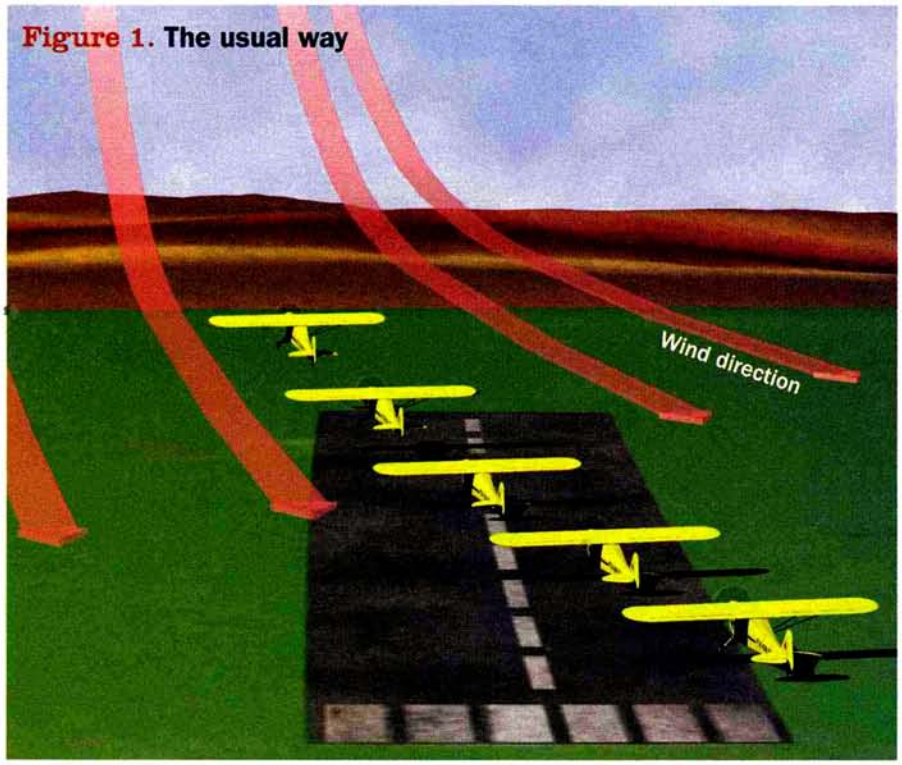
Crosswind Takeoffs & Landings

DON'T BE GROUNDED BY THE WIND!

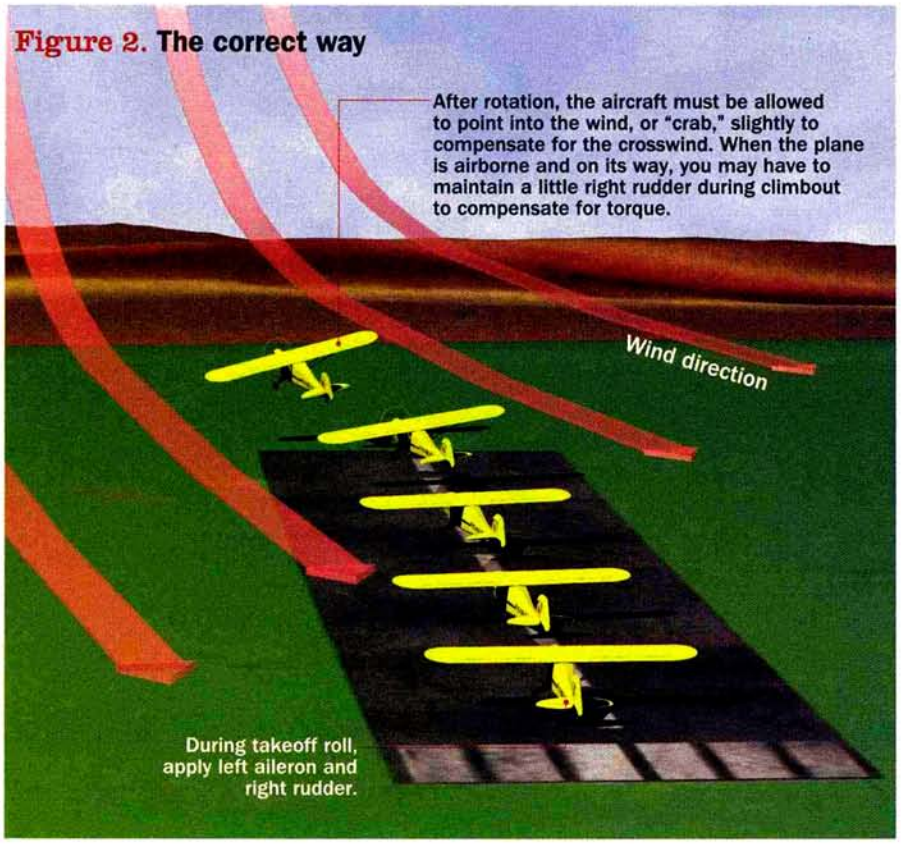


There are many ways to do crosswind takeoffs, but one thing is for sure: when you learn how to handle a crosswind successfully during takeoff, you'll not only be a safer pilot, but you'll also have a lot more fun—especially on those windy days when other fliers are grounded!

BY DAVE PATRICK
PHOTO BY GERRY YARRISH
ILLUSTRATIONS BY FX MODELS



1 Typically, modelers aim their models straight into the wind and take off. Unfortunately, this doesn't help improve crosswind flight technique.



2 To take off straight down the runway, feed some aileron into the wind direction and apply opposite rudder to prevent the model from weathervaning into the crosswind. Keep your departure angle gradual.

IN THE BEGINNING

In crosswind takeoff conditions, some modelers cheat by taking off straight into the wind instead of down the center of the runway. There's nothing wrong with doing this, but if you always do it, you'll never learn the proper crosswind technique.

The "cheating" technique can also be dangerous if, as happens frequently, the wind is coming from the pit area or the spectator area. The real answer is to learn how to maintain full control while going down the center of the runway. If you're reluctant to go straight down the centerline, go easy on yourself during your first attempts: compromise the angle of your takeoff run. As you gain proficiency, you can work your way towards taking off right down the centerline. With practice, there's no reason why you shouldn't be able to take off in a 90-degree crosswind.

In a competition I once participated in, this practice really paid off. I flew in 15-knot winds blowing at a 90-degree angle to the runway centerline. It was a long day for competitors who had difficulty coping with the crosswind!

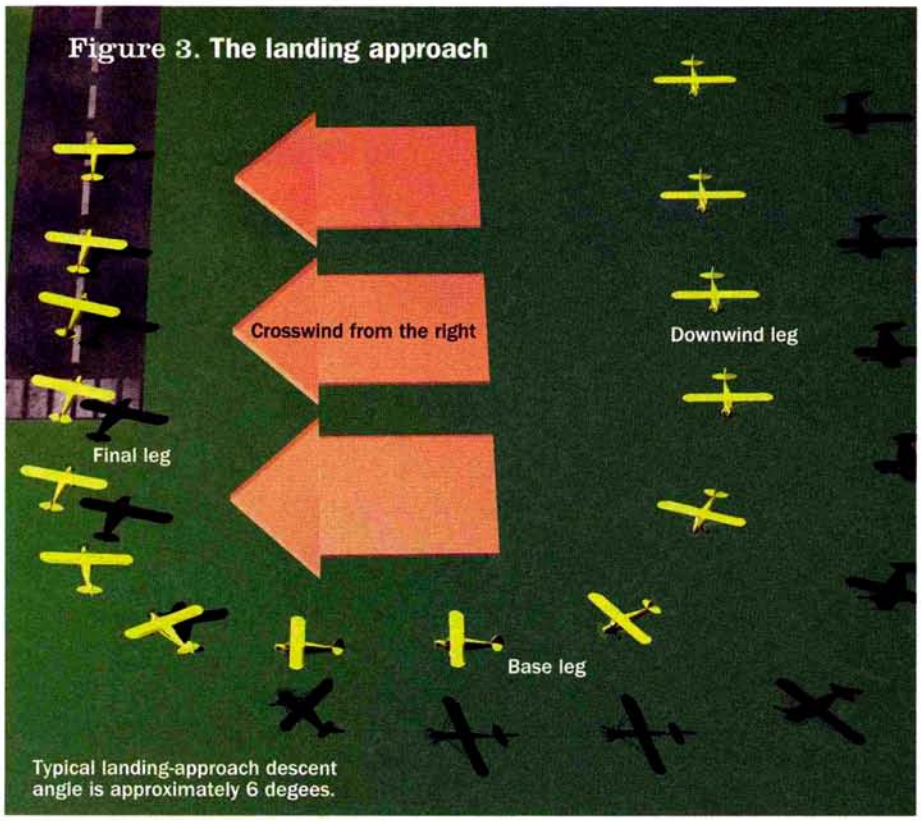
Before you even start to roll down the runway, try to get a "feel" for what's going to happen by paying close attention to the wind direction and strength. In fact, before taking off, pilots of full-scale aircraft are repeatedly told the wind direction and strength because these factors have a dramatic effect on handling.

LET'S GO

Let's look at a takeoff that has a fairly strong crosswind from your right. First, you should input a little right aileron—or at least be prepared to input right aileron to prevent the wind from getting under the upwind wing and possibly flipping the aircraft over. Then, because the tail will try to "weathervane" the aircraft into the wind, apply left rudder during the initial takeoff roll (this is the opposite of what you'd normally do on a calm day). The amount of input will depend on the crosswind (i.e., its strength and direction), the size of the fin and rudder and the amount of power you apply.

As speed builds, you'll use less rudder. When the aircraft is about to lift off, you may need to apply right rudder to keep the aircraft right on the runway centerline.

When your aircraft is ready to lift off, don't horse it off. Gently rotate, allowing plenty of airspeed to build up, and then climb out gradually, e.g., at a 5- to 10-



3 The easy way to compensate for a crosswind during a landing approach is to establish a natural crab angle so that your plane points slightly into the wind and tracks parallel to the runway. You must remove the crab angle just before the model lands.

degree angle. As you rotate, also remove any right aileron input; from here on, use ailerons to maintain wings level.

During most climbouts, I keep some right rudder in to counteract torque and to maintain a straight track. In a crosswind takeoff, it's important to use the rudder to correct the heading as well.

PRACTICE

If the wind is from the left during takeoff, you'll have to apply left aileron and right rudder during takeoff. Then, as speed builds during climbout, you'll need less and less rudder until you reach the point at which you'll need just enough right rudder to counteract torque. Practice makes perfect, and planes differ. It isn't unusual to find me at the airfield just practicing takeoffs and landings instead of the usual aerobatics. Knowing what to do will really help you with crosswind takeoffs. Don't be intimidated; with the proper skills, it's amazing how strong a crosswind you'll be able to handle.

LANDING IN A CROSSWIND

Now comes the fun part: landing your aircraft in one piece in a crosswind! It isn't that difficult, but you'll have to follow a fairly basic formula. Then you'll have to practice and build up your confidence on the sticks to make it happen. Trust me; you can't cram all this in at once, and an Evelyn Wood Speed Flight Training course isn't available yet!

BEFORE WE START

Regardless of conditions, the key to any successful landing is a good approach. In a crosswind, I strongly recommend a longer approach, as it allows you more time to get set up properly and time to settle into the right approach angle. Also, if you end up on an approach that you're not happy with, don't hesitate to go around and try again. Last, be consistent; fly a rectangular landing pattern every time you land.

HOW STRONG IS THIS CROSSWIND?

The strength of the crosswind is determined by its speed and direction. For a given wind speed, the effect the crosswind has on your plane is greatly affected by its angle. For example, a 15mph crosswind at 90 degrees to the runway can be quite difficult to contend with; at 45 degrees, it isn't too bad; and at 10 degrees, you'll barely notice it. Make sure that you have a clear picture of how the wind will affect your aircraft before you take off.

THE APPROACH

There are two basic ways to compensate for a crosswind during a landing approach. The easy way is to establish a natural crab angle so that your plane tracks parallel to the runway, and the fuselage is slightly angled into the wind. The difficult way is to side-slip the aircraft with respect to the relative wind by maintaining a heading and a track that are parallel to the runway. (At this point, the fuselage is parallel to the runway.) I'll focus on the easy way because it's just as effective.

Turning from base into final establishes the crab angle, which is determined by the crosswind. Guess what the crab angle should be, and observe what happens. If, for example, your plane has too large a crab angle, gently turn it to reduce the angle slightly. Don't go overboard trying to yaw or rudder-turn to correct because at low airspeeds, you may find your plane in a spin—literally. Also, try to keep your approach speed constant from the turn going onto base. A good final approach speed is about halfway between stall and cruise, or at about a 25-percent power setting. Planes vary, and when you practice, experiment to determine the best approach speed for your particular plane. The stronger the crosswind, the faster I like to fly the approach.

FLARE

Now that you've flown a nice approach to the runway, it's time to prepare for touchdown. Although the flare will be conventional, it does have a very important twist. You have to add some rudder to get rid of the crab angle that you established during your approach. The best technique is to wait until the last moment before touchdown and then apply rudder very gently to reduce the chance of a spin. Applying rudder reduces the side load on the landing gear and establishes a straight rollout. Keep in mind that wind velocity is often dramatically less close to the ground, so when you begin your flare, be prepared for a loss of lift during the last couple of feet.

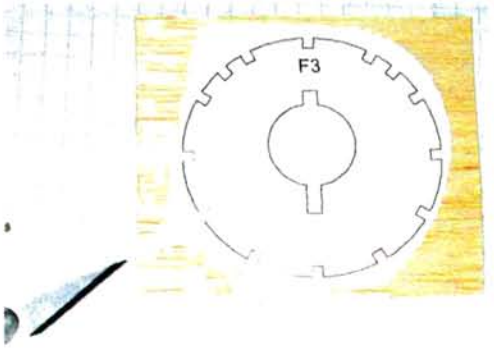
There's really no need to be grounded when a crosswind is blowing. Once you've mastered the proper techniques, you'll be surprised at how well your plane handles.

BY LE PHAN > PHOTOS BY MARC KLINGER

F-104 Starfighter

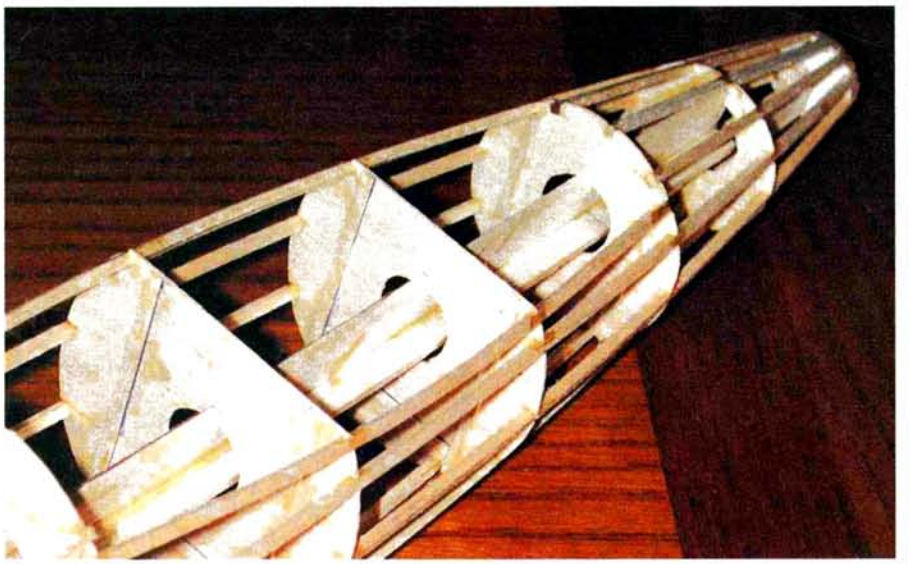
A Speed 400 pusher jet with performance

I HAVE BEEN FLYING SPEED 400 electric-powered models for years with great success and have gotten a lot out of these inexpensive, $9 motors. So, I thought "Why not see how far I can push a standard Speed 400?" When I took my F-104 Starfighter to the flying field, however, all I heard was, "It doesn't have enough wing on it!" For those who are not familiar with the Lockheed F-104 Starfighter, it was the U.S. Air Force's first Mach 2 jet interceptor and was first flown on March 4, 1954. It had very small anhedral wings and was very fast; in fact, many referred to it as "The missile with a man in it!"



Start by cutting out all the formers. To avoid tearing away the corners, cut the notches out first and then cut out the rest of the former.

To stiffen the formers, I glued support strips across the grain.



Here, the fuselage is taking shape, and several stringers have been installed. Notice the alignment crutch that runs through the formers. It will be removed later.

SPECIFICATIONS

MODEL: Lockheed F-104 Starfighter
TYPE: electric pusher-prop jet
WINGSPAN: 16.5 in.
LENGTH: 41 in.
WING AREA: 110 sq. in.
WEIGHT: 18.6 oz.
WING LOADING: 24.3 oz./ft.
MOTOR: Graupner Speed 400
PROPELLER: Kavan 6x4
SPEED CONTROL: Great Planes C-30
BATTERY: 8-cell, 600mAh AE Ni-Cd
RECEIVER: Hitec Electron 6 FM
SERVOS: 3 Hitec HS-55s

Because Speed 400 motors are able to handle wing areas as small as 100 square inches, I built the Starfighter in 1/16 scale so it has a wing area of about 110 square inches; it has a 16.5-inch wingspan and is 41 inches long. With a projected flying weight of about 17 ounces, its wing loading would be an attractive 22 ounces per square foot. To keep the airframe light, the entire plane is sheeted with 1/32-inch A-grain balsa.

STIFF, LIGHT FORMERS

Cut the former patterns out of the plans, and use a glue stick to attach them to 1/32-inch C-grain balsa sheet; position the grain horizontally. Cut out the notches first to avoid tearing off the corners; then cut out the center and the outside portions. Peel off

FLIGHT PERFORMANCE

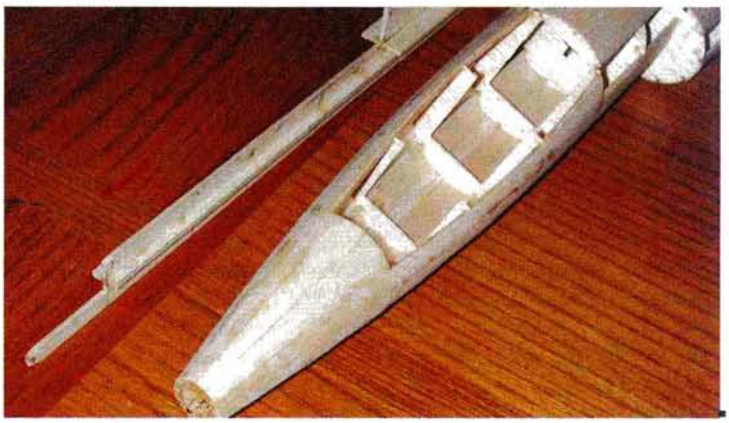
MY FIRST TEST FLIGHT WAS ACTUALLY A "glide" test; everything except the battery and motor was installed in the plane. I installed a small receiver battery pack to power the receiver and servos. It weighed 9 ounces all up for the glide test. I had installed the towhook underneath the canopy, and it worked well. After about eight bungee launches, I was able to determine the balance point; it was farther forward than I had calculated. (I had set the balance point at 25 percent of the wing chord for the "glide test," but because the long fuselage adds lift, the final balance point is 12 percent of the chord!) As the angle of attack increases, so does lift. The F-104 glides fast, and its roll rate is very touchy, so tone down your aileron dual rate to 75 percent for the powered flight.

For the powered test flight, the model weighed 18.6 ounces with the motor and battery installed. I stepped on the launch-release pedal, and the F-104 accelerated off the launch pad in a straight line. After the hook had been released from the plane, I applied full throttle. The F-104 climbed at a fast rate almost straight up. I pushed the stick down to level it and started a wide left turn, but the nose kept on going up. After applying full downtrim, I was able to fly the plane level.

The model has good pitch stability with elevator throws of 3/8 inch up and 1/8 inch down. Even with 75 percent dual rate on the ailerons (1/4 inch up and down), the plane was still roll-sensitive. I flew several low-level passes and then decided to land. I reduced the throttle to about 80 percent, and the plane started to descend. Just before it touched down, I flared it and turned off the motor. The entire flight lasted only 1.5 minutes. To see a video of the first test flight, take the "Click Trip."

After pondering the first flight and doing more testing, I realized that when I applied full power, the motor's thrust angle pushed the tail down. I corrected the thrust angle, and all subsequent flights were a joy.

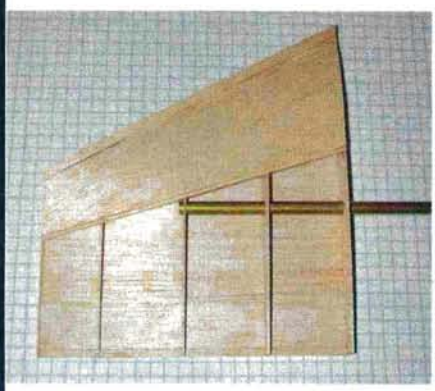
Attach the outer sheeting to the fuselage in sections, as shown here. When the fuselage is rigid enough to hold its shape, remove the internal crutch and add the rest of the sheeting.



The crutch has been removed from the fuselage.

The nose cone and foam canopy add the finishing touches to the fuselage.

The basic wing structure is very simple. The ribs are glued on top of the bottom sheeting.



The main wing spar is a brass tube that plugs into the fuselage.

the paper to save weight. Make sure that you have plenty of sharp hobby-knife blades on hand.

If you can't get C-grain balsa, you can use A-grain and add small, 1/8x1/32-inch-thick balsa cross-strips to stiffen the formers. This may seem tedious, but it will prevent the formers from splitting when you slide them onto the crutch, and it will prevent them from bulging when you apply the outer sheeting.

BIG FUSELAGE

I've found that the crutch method is a fast and easy way to build a straight fuselage. After you've completed the laborious task of cutting out all of the formers, the building process picks up speed. Make the crutch out of 1/8-inch balsa, and use the detailed drawings on the plans as a guide. The crutch must be built straight and true. To ensure that the formers remain vertical on the crutch, I drew lines on it as a visual aid. To help keep the formers square horizontally, I fitted half of an index card between them as a guide. When all 17 of the formers are lined up on the crutch, install the stringers. I added the first stringer at the 12 o'clock position and the next one at 6 o'clock. After confirming that the formers were vertical and square, I added a drop of CA at each stringer-to-former intersection, working from the nose to the tail. I then glued the 3 o'clock and 9 o'clock stringers into place. After I had glued all the stringers into place, I made sure that the crutch was not glued to any of the formers. If yours does stick, check at formers F1 and F2 (since they are the smallest, they're closer to the crutch).

I then applied some sections of fuselage sheeting in a checkered pattern. Once the fuselage was rigid enough to hold its shape, I used a hobby knife to carve out and remove the crutch so I'd be able to finish the sheeting. I then glued on the balsa nose block and the air inlets and carved and sanded them to shape. The air-inlet nose cones are made in the same way.

LITTLE WINGS

I cut out the bottom wing sheet and ribs first, and then I drew lines on top of the sheeting to help align the ribs and the rear spar. I glued the rear spar onto the wing sheet to help guide the ribs. Note that the R0 ribs are not glued to the wing sheeting but are reserved for the sides of the fuselage. The main wing spars are 1/4-inch-o.d. brass tubes that slide into the wing-spar root that's built into the fuselage structure. (See the plans for details.)

After you've applied the front and rear top sheeting, cut out the ailerons. Once I had finished the wings, I installed the servos. I used Hitec HS-55s for this project: one for each aileron and one for the elevator. I made my own control horns out of 1/16-inch plywood.

TAIL SURFACES

The elevator and vertical fin/rudder are made separately and then attached to the fuselage. The elevator was cut out of 1/8-inch-thick balsa. The fin/rudder is hollow. I used 1/8-inch-square strips for the spars and covered the sides with 1/32-inch sheeting. Because the elevator is an all-moving control surface, it requires a pivot tube. I simply soldered a 2-inch-long, 1/8-inch-o.d. brass tube to a perpendicular 1/8-inch brass C-channel. This makes it a T-hinge setup. The elevator axle is a 4-inch-long, 0.093-

o.d. brass tube, and it fits into the T-hinge. The axle tube fits in a slot cut in the elevator. I slid the elevator axle into the T-hinge and then glued the axle to the elevator. You may want to cover the elevator before you glue the axle in. For simplicity, I decided to install the elevator pushrod externally on the right side of the vertical fin. You can install the pushrod inside the fin if you want a cleaner appearance. There's plenty of room in it.

COVER AND FINISH

I chose a Canadian version of the F-104 and used silver UltraCote to cover the model. All the markings and numbers were cut out of UltraCote and ironed into place.

I carved the canopy out of a block of pink foam, sanded it and then covered it with ½-ounce fiberglass cloth. I used water-based polyurethane instead of epoxy resin. Two coats of polyurethane hardened the surface nicely.

The finished weight of the model is 18.6 ounces—a little heavier than I had hoped for but still plenty light.

BUNGEE LAUNCHER

Without getting into too much detail here, I used 17 feet of 5/16-inch-diameter standard rubber bungee material and two hooks from the hardware store. The anchor end of the bungee is a 2x6x14-inch block of wood and is 14 inches off the ground. Picture the top of a foot stool as the anchor point. This gives an upward pull on the plane of about 2 degrees when completely stretched out. The airplane end of the bungee has a 16-foot piece of nylon string tied to it with two rings attached to it 12 inches apart. One ring is hooked to a release pin that's part of the launch pad/model cradle, and the other ring is attached to the model's launch hook. I installed a Graupner GR627 glider towhook on the bottom of the fuselage right under the rear canopy section. I stretched the bungee by taking six normal paces, and that was enough tension to launch the model. Just make sure that you apply full elevator during the launch. You don't want your plane to crash into the anchor block (don't ask how I know this—ouch!).

So, yes; you can make an F-104 Starfighter fly with a cheap little Speed 400 motor, but it really does need more speed to live up to its reputation as a high-speed interceptor, so my next version will have a cobalt or brushless motor to really make it cook! ✈

See the Source Guide on page 151 for manufacturers' contact information.

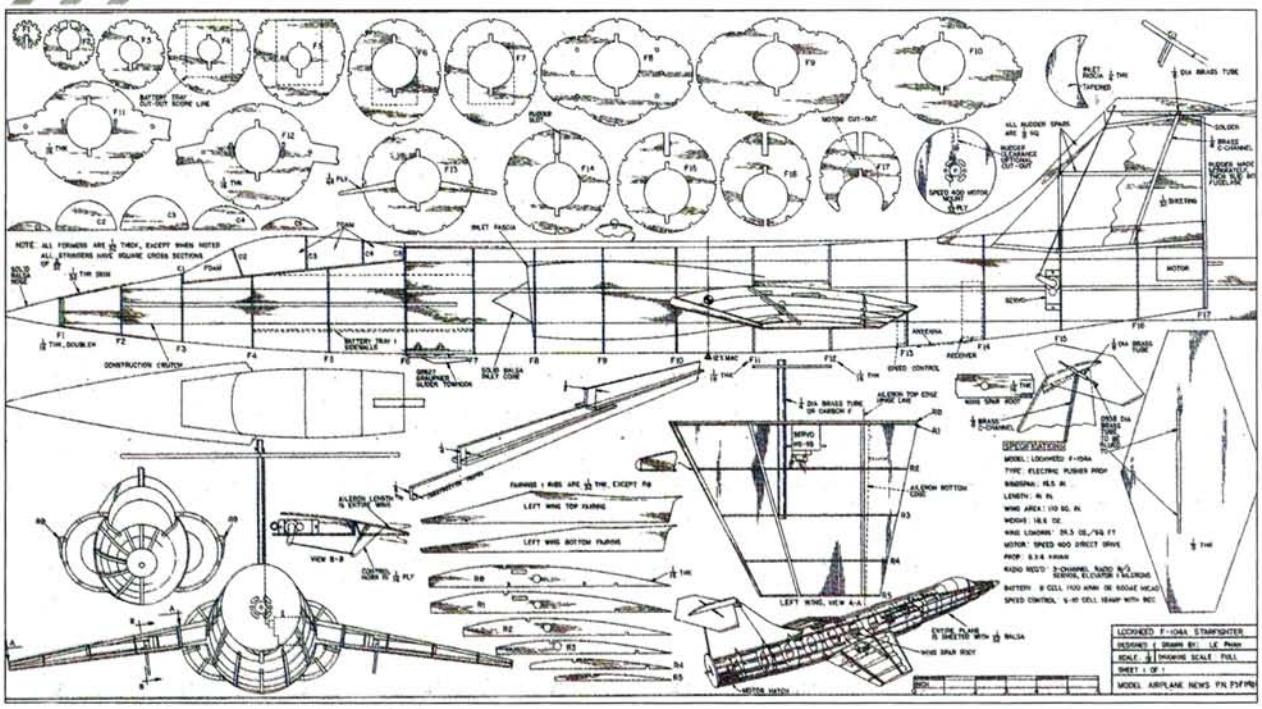
COMMENTS

Designed by Le Phan, this impressive F-104 Starfighter jet uses a Speed 400 motor and a pusher prop for thrust. It flies great and is built around a removable alignment crutch. The author launches the Starfighter with a bungee catapult.

The very simple, effective, all-moving elevator is easy to make and install.

click trip MODELAIRPLANENEWS.COM FOR FIRST-FLIGHT VIDEO

FSP0905A F-104 STARFIGHTER



TO ORDER THE FULL-SIZE PLAN, VISIT RCSTORE.COM ONLINE.

BY GEORGE LEU › PHOTOS BY DERON NEBLETT & GEORGE LEU

Painting with Klass Kote

THE NEXT-GENERATION TWO-PART EPOXY-FINISHING SYSTEM

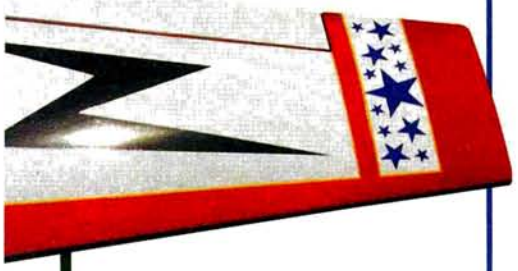
MANY YEARS AGO, WHEN K&B SUPERPOXY and Pettit Hobbypoxy paints were removed from the market by the EPA, many serious scale modelers cried out in dismay; I had used these paints on all my pattern planes and was very saddened when they disappeared! For years, modelers like me hoarded our remaining supplies (I amassed well over 200 cans of K&B Superpoxy and Hobbypoxy epoxy paints and catalysts), and we constantly searched the back shelves of hobby shops to ferret out any remaining cans of it as though they were nuggets of gold. Those old, two-part epoxy-finishing materials were that good!

About a year ago, Diversified Solutions in Minneapolis, MN, introduced Klass Kote—a two-part epoxy paint that comes in a variety of colors, primers and clearcoats. Naturally, it got my attention; but when I heard that it could be used with the old K&B and Hobbypoxy paints, I was very excited!

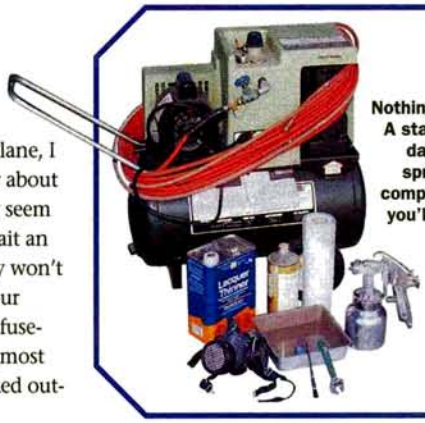
I contacted Klass Kote's Nate and Laura Dickerson and found them to be very friendly and helpful. We discussed their products in detail, and I learned a thing or two, such as to allow the mixed paint to sit for about 30 to 40 minutes prior to application and to mix the paints in one jar but not in the spray gun's paint container. I couldn't wait to try it out!

My test model was a Sig Mustang 450 pylon racer. It looks great, doesn't it?

To get a great paint job, you have to prepare the model; it must be blemish-free!



Crisp lines aren't a problem with Klass Kote. It's all in the preparation!



Nothing fancy here! A standard, everyday automotive spray gun and a compressor are all you'll need to use Klass Kote!

TEST MODEL

To test the new paint, I chose my Sig Mustang 450 pylon racer that was just ready for finishing. It was an especially good choice for this article because racers require a smooth, glossy finish. I had already primed the model with a lacquer base coat, but since Klass Kote works well on almost any substrate, I thought it would make a good test bed.

The thing to remember about any painted finish is that it will only be as good as the surface beneath it. You have to prepare the model by filling gaps, sanding out high spots and filling in low ones. No paint can hide these kinds of flaws; in fact, depending on the colors you use, flaws can actually become more noticeable!

PAINTING THE MODEL

The instructions recommend a mixing ratio of one part paint, one part catalyst and one part reducer. This produces a consistency similar to milk's, which works fine with my spray equipment. I used a standard automotive spray gun and an air compressor with a 5-gallon reserve pressure tank. I found that the paint works well with the gun pressure set at about 55psi.

I applied the white base coat by first spraying a couple of light-mist coats. I let them set for a few minutes, and then I sprayed on a slightly heavier final coat. The paint covered the gray primer beautifully, and the results were very impressive.

About an hour after I painted the plane, I moved it into my shop to let it dry for about a week. Even though the surfaces may seem tack-free in 20 minutes, you should wait an hour before you handle the parts; they won't become "fingerprint-free" for about four hours. The following week, I took the fuselage outside and into the sunlight. I almost went blind from its reflectivity; it looked outstanding!

I wet-sanded the areas to be trim-painted with 600-grit sandpaper and cleaned the model with an automotive surface-prep agent prior to applying the masking tape. I used vinyl tape and then covered the rest of the model with a good-quality paper masking tape and two layers of newspaper. I rolled the edges of the tape down firmly to prevent paint from bleeding under it.

Within a few minutes, I had applied the red trim, and I carefully removed the tape. I wasn't delicate in removing it, yet there was no indication that the tape had pulled up any of the base color. I give Klass Kote high ratings for bond strength over a lacquer base.

As a test, I mixed the red paint with about 25 percent more reducer than was called for. The extra reducer lessens the paint's opacity and caused it to run more than the properly mixed white paint. The bottom line is: follow the mixing instructions, and the paint works great!

PRODUCT COMPATIBILITY

After another week of cure time, I tested the paint's compatibility with my old epoxy paints. I added the blue trim, which was a mix of Klass Kote blue and Klass Kote catalyst with K&B thinner. The black trim was a combination of K&B black, K&B gloss catalyst and Klass Kote reducer. The results were excellent! The final addition of a glossy Klass Kote clearcoat made the colors stand out and gave the model a molded-of-glass appearance. Wow!

FINAL THOUGHTS

Klass Kote certainly has good interchangeability with K&B Superpoxy, but I found that it cleaned up much better when I used its own reducer. Lacquer thinner also works OK to keep the spray-gun parts clean. For sure results, however, it is always best to use all the Klass Kote products together.

Klass Kote has outstanding chemical resistance, durability, low porosity and high bonding strength. When the components are mixed properly, a chemical reaction generates heat and turns the mixture into a hard, inert film. It has a comfortable working time in which it can be applied. At the end of this working time, the mixture becomes warm and quickly begins to harden. Placing mixed paint in a refrigerator will lengthen the working time but not indefinitely. Before mixing, shake the paint and catalyst vigorously for several minutes and, if the products have been sitting awhile, stir the paint from the bottom with a mixing stick. For optimum results, apply the paint at between 50 and 80 degrees F. Humidity slows curing time, so do not spray it on days with higher than 70 percent humidity.

Note: for more information on using Klass Kote products, check out Dave Platt's newest Black Art Series DVD, "Understanding & Using Epoxy Paints."

I am very pleased with the results using Klass Kote paints. One quart of reduced Klass Kote will cover approximately 75 to 100 square feet, but with more porous surfaces, the coverage is approximately 60 square feet. The colors are vibrant, and there are 26 to choose from. The ability to mix Klass Kote with the K&B Superpoxy products is the icing on the cake!

See the Source Guide on page 151 for manufacturers' contact information.

Look closely, and you can see the paint's smooth-as-glass "wet" look!

BY GREG GIMLICK PHOTOS BY GREG GIMLICK

CONVERT A ¼-SCALE AEROBAT TO ELECTRIC POWER

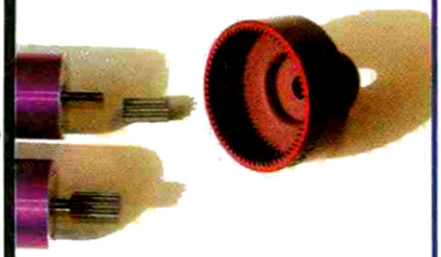
QUIET & CLEAN, WITH PLENTY OF PERFORMANCE

EVERY SO OFTEN, A MANUFACTURER OFFERS AN ARF that begs to be converted to clean, quiet, electric power. When I first looked at the ¼-scale Cermark Pitts, I knew that its high-quality design and construction offered a lot of potential for a successful power switch. This article covers the conversion of the Pitts to electric power but doesn't cover the actual assembly. The goal is pretty obvious: convert the Pitts to electric power without making wholesale structural changes that require this ARF to be rebuilt or redesigned. The manufacturers and vendors who provided the power equipment I used in this plane offered tremendous assistance and helped to demonstrate just how far electrics have come. Let's get the project going.

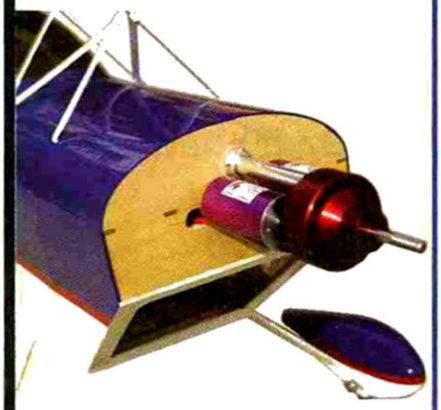
The Cermark ¼-scale Pitts Special is IMAA-legal and performs great with electric power.

THE EQUIPMENT

With the huge variety of equipment available today, the choices seemed endless. To avoid having to buy a lot of new gear, I tried to use as much of what I had on hand as possible. A project of



Two Feigao motors with pinions being installed. Note the full, deep-tooth contact with the bell gear.



The Inner Demon 32 gearbox and motor assembly bolted directly to the firewall. The custom-made standoff legs fit perfectly.

Access holes in the bottom of the fuselage and cowl permit cooling air to enter and provide access to components. Here, I'm installing the battery tray.

this magnitude is not an inexpensive undertaking, but it doesn't have to break the bank. I decided to use two kinds of batteries: the newer Li-polys that have become so commonplace and the cheaper, tried-and-true NiMH cells, which also provide reliable power. I wanted to use brushless motors because of their efficiency and because they require little maintenance, and programmable, sensorless speed controls were a must.

Motor/gearbox combination I had an Inner Demon 32 gearbox from Model Machining in the shop that I had used for a "Product Watch" some time ago, so it seemed a good choice to use as the basis for the system. The 32 gearbox is the big brother of the more commonly seen Inner Demon 48 and is clearly a much heftier box. To begin with, the bell-housing gear (the equivalent of a spur gear in a normal gearbox) is deeper and uses a much longer pinion to provide full-tooth contact for added strength. Machined by Dan Redfern, the stainless-steel pinions for this box can hold up against the extreme forces being put through these big, ganged-motor systems. Dan's machine work is impeccable, and his help in this project was greatly appreciated; when I needed a different ratio, he made new 4:1 pinions for me. He also cut the standoffs to the exact length I needed so the setup would fit the cowl without my having to extend the firewall!

I needed a few motors, so I discussed the project with Jamie Baker of Starluck RC, and he provided two Feigao 540810XLs. These relatively inexpensive, slotless brushless motors have a KV rating of 1668 and perform well at the current levels I projected. Jamie imports a full line of Feigao motors; the high-end models sell for around $110 each. The motors have standard mounting holes so they fit the gearbox without modification, and they have 5mm shafts.

Electronic speed controls I've used Castle Creations speed controls since Patrick del Castillo first produced his brushed controllers and have come to rely on his advice and recommendations. He and marketing director Shawn Palmer helped me with this setup, as they were experienced in ganging two brushless motors and were familiar with the problems that can arise. They gave me helpful advice on how to program them

MODEL SPECS

Model: Cermark Pitts 2B
Wingspan: 60 in.
Length: 58 in.
Weight: 9.5 to 10.5 lb.
Price: $349.95

THE FINAL NUMBERS

Ready-to-fly weight: 238 oz. (w/32 Great Planes GP-3300 NiMH cells); 222 oz. (w/two 5S3P Li-poly packs)

Wing loading: 33.8 oz./sq. ft. (w/NiMH cells); 31.5 oz./sq. ft. (with Li-poly packs)

Prop rpm: 6,200 with an APC-E 20x11 prop

Current draw: 59 amps per motor

Thrust: 250 oz.

GEAR USED

Motors: Starluck RC Feigao 540810XL brushless (2)

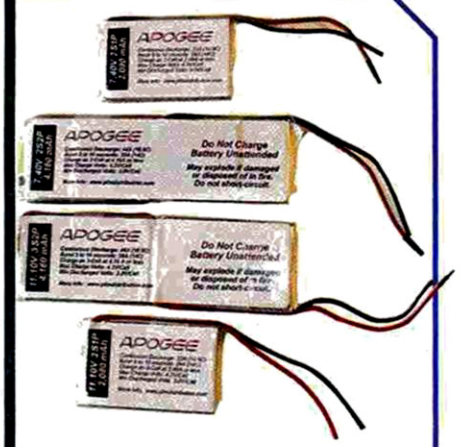
Gearbox: Inner Demon 32

ESCs: Castle Creations Phoenix 80 (2)

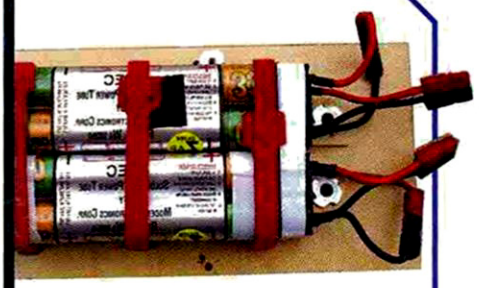
Radio: Multiplex Royal Evo 9-channel; Hitec Super Slim 8-channel receiver w/HS-85BB servos

COMMENTS

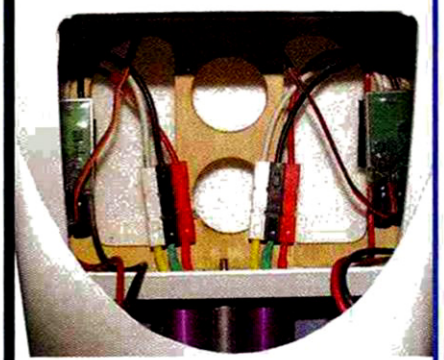
Computer projections for ganged motor setups should be used only as guidelines to find a starting point. In comparing the projections with my final results, I found that instead of the projected 125 watts per pound, the converted Cermark actually produces 140 watts per pound. The projected prop rpm was 5,500. This is a huge difference with a 20-inch prop. The voltage depression predicted by the simulation was higher than the actual measured depression under load, so that accounts for the increase in power and rpm. I measured thrust with a crude spring scale.



These Apogee Li-poly packs will be made into a 5S3P pack. By the time you read this, PFM Distributing will have factory-assembled 5S3P packs available.



The battery tray with both Model Electronics Corp. 16-cell, GP-3300 NiMH packs (Solderless Power Tubes) attached.



A view up through the access hole reveals the two Castle Creations Phoenix 80 controllers mounted on each side rail.

in the Pitts. We chose two Phoenix 80 controllers because they would give me a little headroom with the projected current of 60 to 70 amps. With their new USB programming link, it took only minutes to prepare both controllers for installation.

When I asked whether I should use fixed throttle settings or auto-calibrating in ganged-motor setups, Shawn replied, "Fixed, because you don't want the auto-calibrating running anything other than exactly the same throttle response from both controllers. Same deal for a standard twin airplane: fixed throttle response gives identical power response from both motors." Patrick and Shawn are full of good information that they're willing to share, so I often turn to them for advice on unusual setups.

>Batteries My first setup used two, 16-cell packs of Great Planes GP-3300 NiMH cells, since each side of the ganged motor setup is its own individual system. I called Pete Peterson at MEC, and we discussed the options. He recommended the 3300s, as they stand up well to high current and numerous cycles. I decided to use his solderless power tubes (SPTs) because I like to be able to remove questionable cells, and I just hate soldering! Pete sent zapped cells all configured in his SPTs using his new silver paste, and that has really helped the conductivity of the press-fit configuration. I joined two 8-cell packs in series for each big pack, and they were mounted on a removable battery tray. A few cycles in the shop for each 16-cell pack, and they were within 2/10 volt of each other.

>Radio gear My transmitter is a Multiplex Royal Evo 9-channel synthesized radio with frequency scanner module. I can't say enough about this radio and scanner combo! I bought a Hitec Super Slim 8-channel receiver because I wanted to put each aileron on its own channel, and with the Evo 9, that's a no-brainer. The kit is designed for a servo on each aileron, and I chose HS-85BB servos and assigned each a channel on the receiver. This made it a cinch to trim the ailerons to align perfectly and saved a bit of weight over using standard-size servos with equal torque. The tail servos are HS-635s mounted in the tail. A 5-cell NiMH pack run through an MPI voltage regulator powers the receiver.

FINAL ASSEMBLY

The photos tell the story best, and you can see that everything went together without airframe modifications. The chin of the plane already had a large cutout, and it provided perfect access to the battery tray. The fiberglass cowl had a cutout that I enlarged slightly just to make it easier to slide the battery tray in and out. The standoff legs for the gearbox are bolted directly to the firewall, and they set the spinner backplate perfectly to the cowl. To arm the motors, I can reach up through the bottom of the cowl and plug each controller into its battery pack. The only change to the airframe was to open a section under the aft portion of the fuselage to allow the cooling air to exit. I simply cut out the covering between parts of the framework. This has to be the easiest conversion I've done!

CLOSING THOUGHTS

This has been a dream project! The quality of the airplane itself is spectacular, and the components recommended by the manufacturers/vendors worked perfectly. Because the 5S3P Li-poly packs I used were put together in my shop and not manufactured as 5S3P packs, they aren't as closely matched as they should be. I don't recommend doing them this way, and the folks at Apogee don't, either. I haven't had any problems with them, but I keep a close eye on them and will replace them with manufactured 5S3P packs as soon as Apogee makes them available.

The plane is an honest flyer with no habits you wouldn't expect from an aerobatic bipe that has a wing loading in this range. In a spin, you must be patient and fly it out; it won't just power out with throttle. Stalls are straight ahead without a tendency to drop a tip, but you must maintain some speed on landing and fly it in, or it will surprise you. With the power available in this setup, you can get yourself out of trouble if you have the altitude. What I love about a Pitts is that it flies like a real plane, and this one doesn't disappoint. It can't hover, but neither can a full-scale Pitts! It's just an honest, gorgeous, aerobatic biplane, and I couldn't be happier with the conversion.

See the Source Guide on page 151 for manufacturers' contact information.

BY GERARD JUMELIN > PHOTOS BY GERARD JUMELIN

THE VARIANTE 50

BUILD A MINI FLYING WING!

The three amigos: Gerard Jumelin, Jean-Yves Martin and Jean-Marie Piednoir.

THE VARIANTE SERIES OF MICROFLYERS IS A LARGE FAMILY OF models with approximately 20- to 44-inch wingspans. The Variante 50 ("V 50") is my smallest variation on this pure flying-wing theme. All of the Variantes are designed according to the Horten brothers' formula: pure flying wings have no vertical surfaces, so they have no tails or fins. You may not know that stealth technology was invented in Germany circa 1933. If you visit the Planes of Fame Museum in Chino, CA, you can admire the 1940 Horten IV glider that was brought to the U.S. after WW II.

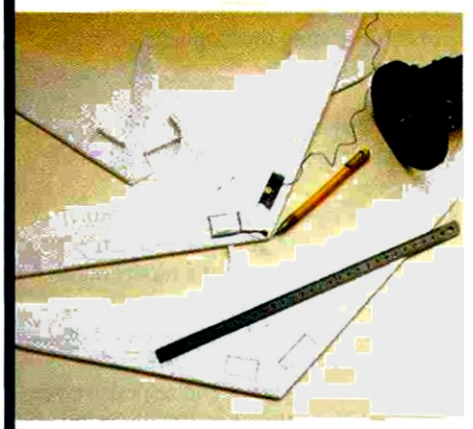
The V 50 is the V 60's little sister. They both use JMP Combo RC gear and KP-00 propulsion units. The larger V 60 is optimized for slower indoor flying, and the smaller V 50 is quicker and more agile. The V 50's wing is twisted, and its tips act as stabilizers. The washout isn't linear as it is on most flying wings; in fact, there is practically no washout from the center to the elevon root. Then the negative twist increases to about 10 degrees. I won't talk at length about aerodynamics; when it comes to finalizing a design, I'm not the theoretical type. While others keep talking about Mr. Reynolds's numbers, I just build the wing. Much of my success is achieved with intuition, careful building and a bit of experience.

LOW TECH

The V 50 version described here requires a straightforward sanding job. Try to work with genuine 6mm-thick Depron board; other brands are not as stiff, and many are heavier. First, cut a full-size template out of 1mm cardboard. Gently sand the cardboard's curves with 400-grit paper. Running thin CA along the template's edge will make it more rigid. When your eyes are burning from the fumes, and after a final polishing, you will almost have a wing.

I like to make templates; they're an interim step from a sketched-out idea to the real thing. Once you have a template, imagination becomes reality. This is useful for drawing the outlines on the board. A few pinholes in strategic places will help you to mark the position of the maximum thickness of the airfoil. Note that the airfoil is a constant 6mm thick all along the span.

Draw the hinge line and additional lines to prepare for the several sanding steps. With a felt-tip pen, draw a half-thickness line on the leading edge of the board.

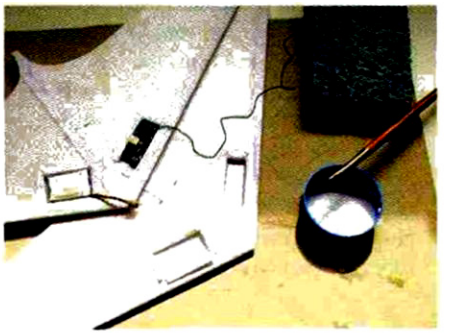


The receiver and speed control fit into cutouts on the underside of the wing. Later, this gear will be held in place with thin, clear tape.

Strengthen and stiffen the edges of the elevons by gluing lightweight airmail paper into place with diluted white glue.

Each wire actuator is held in place with clear tape. The elevons are hinged with 3mm-long strips of surgical tape.

Shim the wing to allow the felt-tip pen to draw the trailing-edge datum guideline 1.5mm (1/16 inch) from the bottom surface. This line can be drawn along the leading edge, too. Two lines are better than one when you have to work step by step.



Ordinary paper glued into place with diluted white glue strengthens the Variante 50's structure and the cutouts for the radio gear.

Draw a diagonal line along the elevon's trailing edge, up to the top surface at the tip. A small, thin, cardboard template will make this operation easy. The washout is first achieved by sanding and then has to be formed into the foam. The washout is linear in the first step (the sanding) and then turns into a curve when you twist the elevon tip.

DUSTY TIMES

Work on a flat board (such as one made of Formica), and wipe the dust off it frequently. Be extra careful, or you'll accidentally etch the Depron board. Avoid scratches that occur *before* you crash! Remember: a vacuum cleaner is your lungs' best friend.

I start rough-shaping the wing using the guidelines I drew. I change my cutting blade often and keep a large stock of spares on hand. Most times, I attack the wing from the back (trailing edge) with a full blade out, removing much material on the upper side of the elevon and less toward the tip.

My main sanding tool is a 20x3cm (7.8x1.1-inch) block with 150-grit paper on one side and 240 grit on the other. The sandpaper is secured to the plywood with double-sided tape. For finishing, I use another block made out of Depron board with 400-grit paper. This one can be curved and is a good tool to use with a light hand.

Aim for a flat-bottom profile at the center. The trailing-edge line is raised toward the wingtips. Because the wing chord becomes wider around the elevon, there is a small thickness step at the beginning of the elevon on the top. The middle of the wing remains untouched and is a full 6mm thick to the trailing edge.

Next, shape the front part. Work only on the upper side of the leading edge. You may use another guideline to divide the job into two steps. Alternate the dusty job on the right and left sides, then check and double-check for symmetry.

Work the underside of the wing, and shave and sand the tips. A flat-bottom airfoil in the center will turn into a semisymmetrical airfoil at the tip. Much of the material is removed near the tip; considerably less material is removed to the root. Now carefully round the leading edge on the underside until the felt-tip pen lines disappear.

PAPER REINFORCEMENT

Ordinary printer or copier paper will considerably stiffen the entire structure. Wrap a 13mm (½-inch) strip of paper around the leading edge, thereby forming a D-tube wing structure.

Dilute white glue 50:50 with water. Brush the diluted glue onto both the paper and the Depron. Once you have folded the strip in two, apply the glue liberally to soak the paper while you brush the foam leading edge. A clean, wet sponge is the best tool to use to apply the paper to the foam. Don't hesitate to add more glue if necessary. Clean the foam around the LE with the sponge and clear water.

Let the wing dry overnight. To prevent distortion, lay it flat and weighted down on a scrap Depron shim to allow air to circulate beneath the leading edge.

The twisted elevons are covered with a lighter paper, such as thin "airmail—par avion" paper. Fold a triangle of this paper over the trailing edge to cover both the top and bottom. Because the wingtips are curved, small slits are required on the folding line. For the leading edge, use white glue and paper on the foam for reinforcement.

Use a Dremel tool to rout the openings for the JMP Combo RC gear and the Kokam 145mAh battery. Very little foam material will remain, so paper walls are again required for strength. Later, a taped paper cover will hide and hold the electronics. The 6mm-thick center part of the wing is stiffened in the same way.

HOT-AIR THERMOFORMING

Just as a hair dryer is used to create perfect curls, so is it also used to thermoform foam. I usually do this all by myself, with both hands doing the twisting while I hold the hair dryer steady between my knees and blowing upward. If you find that you need a third hand for these gymnastics, you can always ask a helper to keep the airflow aimed toward the correct spot! The underside of the elevon is where most of the heat is required.

The elevon hinge line is held right on the table edge. One hand presses the wing flat on the table while the other hand strokes the foam from the center to the tip with a progressive twisting action. Several strokes later, when your fingers have been cooked nearly red hot, the elevon will retain the desired twist as the foam wing cools down.

Lay the Variante flat on the table, and check for the same amount of twist (about 15mm) under both tips. The elevon will be cut and its LE beveled at the end of the process.

RADIO-GEAR INSTALLATION

The plan shows the very latest development of this design. We switched to remote actuators, but the BIRD type we used at first work just fine. We took advantage of Bob Selman's remote actuators with their simple plastic parts and stronger magnets than our originals, and we used our own coils.

Now you can adjust the neutral elevon position with the sliding carbon pushrods. Balancing the plane is easy if the recommended equipment is installed. It would be a pity to add lead to the nose of a sub-1-ounce model.

The biggest advantage of the remote actuators versus the BIRD type is that no cutout is made in the elevon's LE, and this makes the V 50 much more resistant to hard landings.

The 1:2.74 geared KP-00 motor is secured to a thin composite or plywood plate with thin, double-sided foam tape. The propeller shaft is made of 1mm-diameter carbon rod. The connection to the motor shaft is made of two silicone tubes, one over the other. These were purchased in a fishing-tackle shop. The hole in the 3x3 GWS propeller's hub is too large and needs to be bushed. Use rolled paper soaked with CA, or press and glue in a 6mm length of 2mm-o.d. plastic tubing. I adjusted the prop bore with a set of reamers from WES-Technik. The prop is pressed onto the tapered carbon shaft (the taper is achieved with sandpaper while the motor is running).

The rear shaft bearing is a piece of 3mm-o.d. plastic tubing. A smaller piece of 2mm-o.d. plastic tubing is pressed and glued to the carbon shaft. These plastic tubes are part of standard RC pushrods.

> "The model is quick and responsive.... A Variante is not afraid of wind."

The wires to the actuators are held in place against the foam with clear tape. The tape acts as an additional spar. The elevons are hinged with 3mm strips cut of "Blenderm" surgical tape.

The wingtips are part of the elevons. Dynamic and static balance give plenty of control using the magnetic actuators.

FLYING

Please check the center of gravity (CG), and balance the model according to the plan.

A little up-trim is safe before launching the Variante. Apply full throttle, release gently, and let the model build up speed. Trim the neutral, if necessary. After the initial banking, much of the turn is achieved with elevator action.

The model is quick and responsive yet stable. A Variante is not afraid of wind. Once you get used to the model, you can loop and roll. Inverted flight is possible, but you must push on the stick (a flat-bottom airfoil, remember). Of course, try it first at some altitude; the model will take advantage of any lift. Now, go fly!

See the Source Guide on page 151 for manufacturers' contact information.

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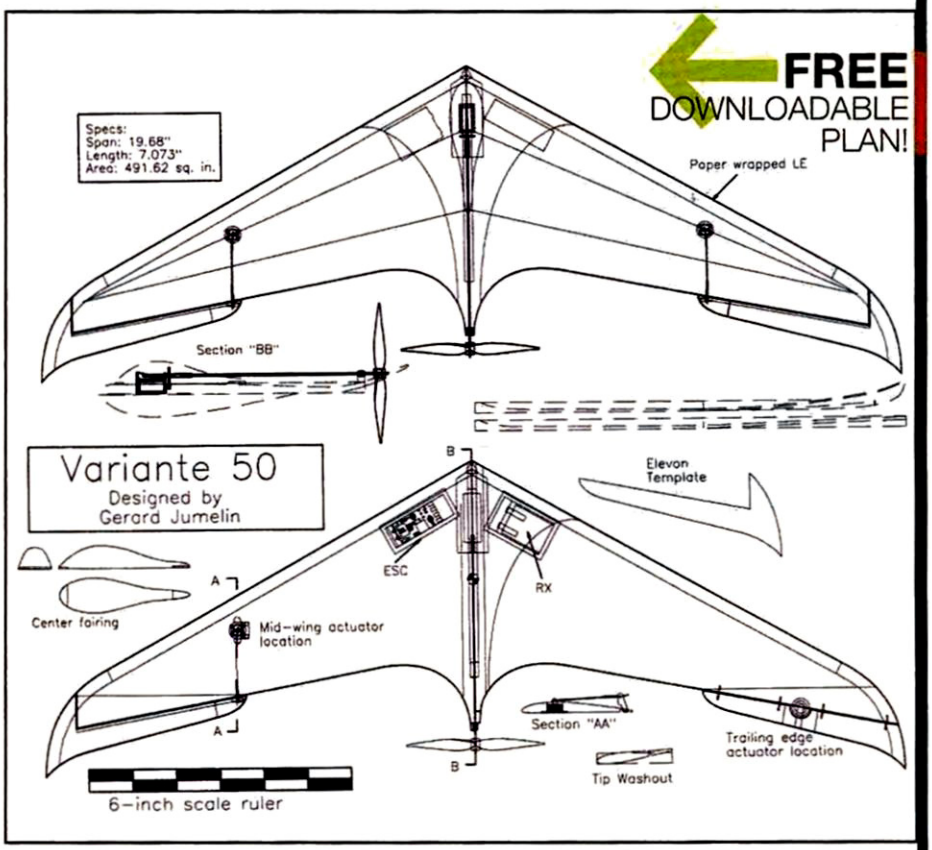
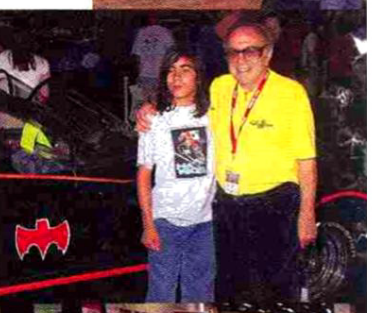


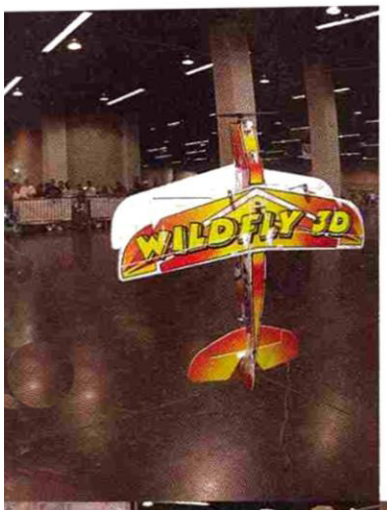
RCX '05™

Action-packed in Anaheim!

BY THE MODEL AIRPLANE NEWS CREW | PHOTOS BY TONY DONALDSON, DERON NEBLETT & JOHN REID

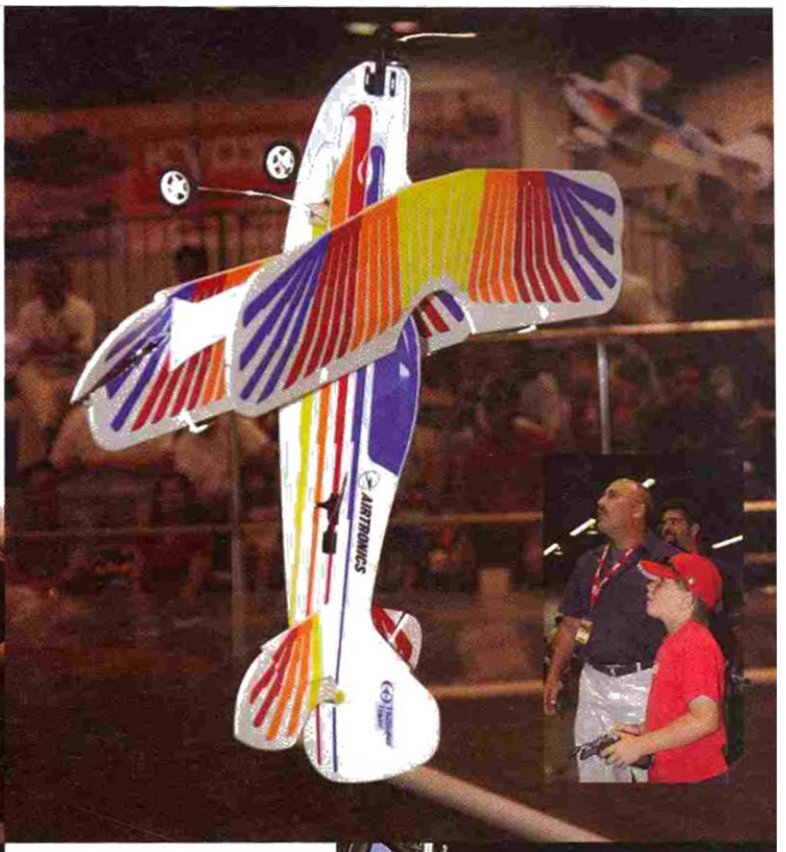
Whew! We just got back from RCX, and it was again the RC event of the year. Where else could you see top 3D pilots pour on the throttle, scope out scads of new products, meet hot-rod legends George Barris and Chip Foose, check out a bunch of custom full-size cars (including the Batmobile!) and watch off-road RC drivers race head to head? Only at RCX!

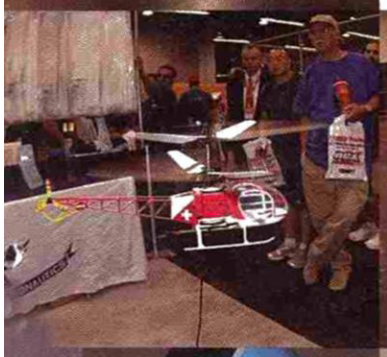




FLIGHT ZONE

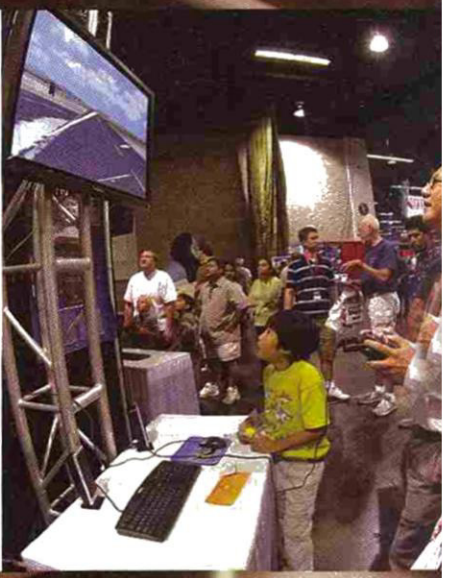
The Flight Zone was busy all weekend. The latest crops of model airplanes, helicopters and blimps were flown above the crowd during expert flight demonstrations. Everything from tiny model aircraft that fit in the palm of your hand to large 3D stunt planes took to the air. Thanks to the Hobbico folks for providing their Frequency Checker to help monitor the frequencies in use.

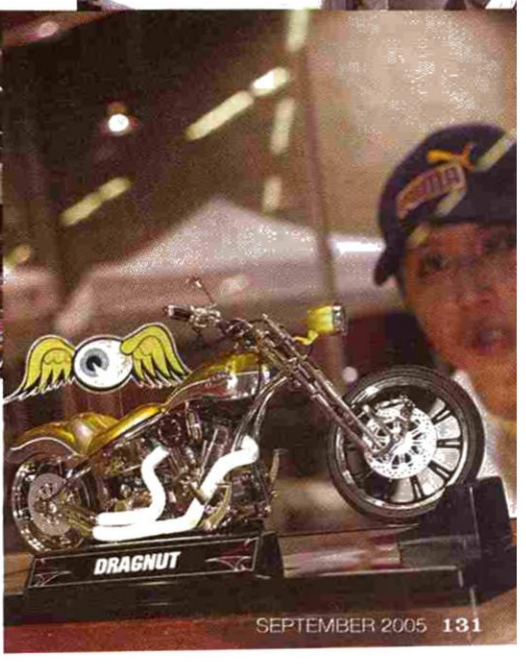




FLIGHT-TRAINING CENTER

This special area gave flight fans a real treat. Great Planes RealFlight G3 sponsored the flight-sim area, providing five sim stations. Virtual pilots—and onlookers—got to watch their progress on 42-inch plasma screens. Sig Mfg. sponsored the "Make It, Take It" center, providing Delta Dart kits for aspiring modelers. For those who dared to "fly" an F-16 jet, FlightLine brought along two of its full-size flight sims with completely functional, scale cockpits and hydraulics.





DIE CAST X COLLECTORS EXPO

The first annual Die Cast X Collectors Expo was a big hit. The biggest names in die-cast modeling were there, including Maisto, Jada Toys, Funline Merchandise Co., Fireball Tim, Die Hard Die Cast, J&S Toys and Collectibles, Prestige Hobbies, Toy Zone Inc., Race Grooves and ProTech Products. Along with the scale stuff, there were many full-size rods, customs and choppers to check out.

HOBBY PEOPLE SUPER STORE

You can't have an RC expo without a place to shop. For the third year, Hobby People set up a store and offered tremendous bargains on all kinds of products. Hundreds of people lined up to buy park flyers, motors, batteries and more. The great deals were more than worth the price of admission.

ALL THE BIG BRANDS

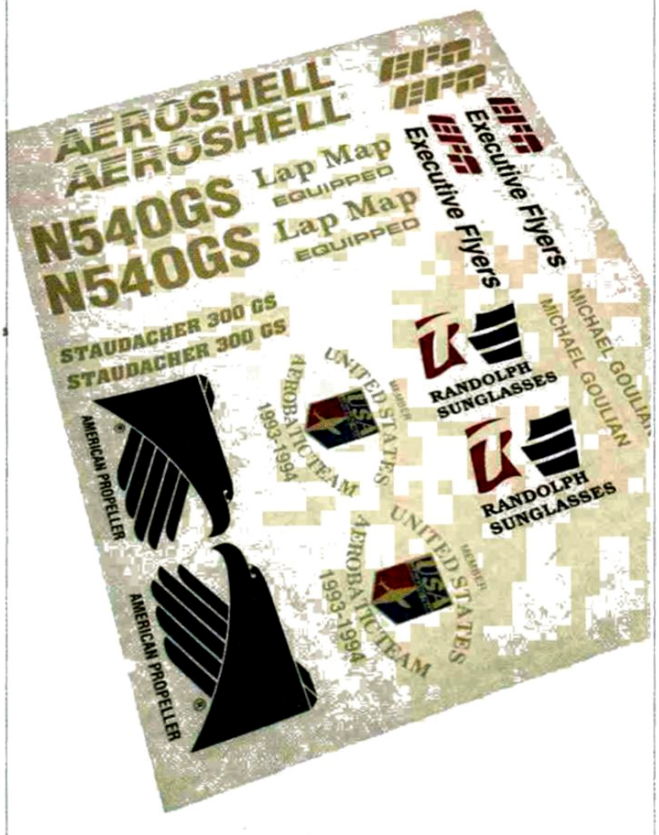
RCX provides a great opportunity to speak directly with your favorite RC companies. Many of the biggest RC manufacturers were there, and this year, there were more after-market exhibitors than ever.

SCORE!

Bruce Slawson of Palmdale, CA, is all smiles as the lucky Grand Prize Winner of the RCX "Fuel Your Passion" Sweepstakes, sponsored by Air Age Media. He won an all-expenses-paid weekend trip to RCX, plus Multiplex's Space Scooter Park Flyer RTF, Team Associated's TC4 RTR and CEN Racing's Aqua Jet Racing Boat. Way to go, Bruce!

RCX

FOR MORE INFO, PHOTOS & RCX ACTION, CHECK OUT RCX.COM

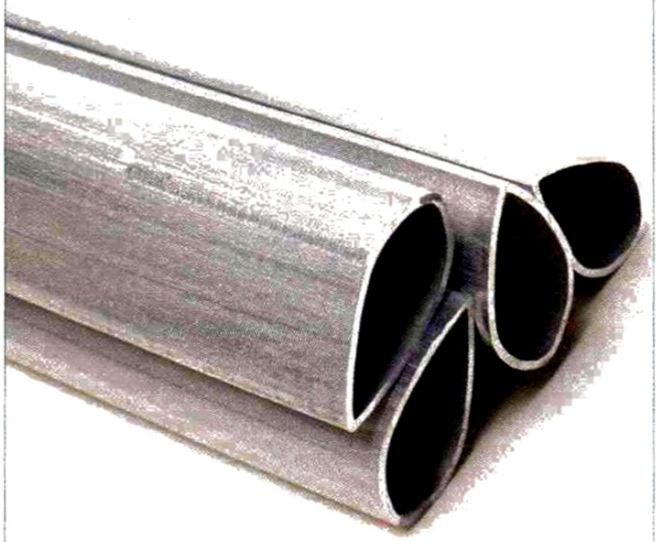


Cajun RC Specialties
Scale Masters Vinyl Graphics
Ragin' Cajun

If you want to give your new model some really great-looking markings that are easy to apply and look painted on, check out the decals available from Cajun RC Specialties. Cajun's Scale Masters Vinyl Graphics are made of premium 2mil-thick vinyl and can be custom manufactured in any size. You can choose from several graphics packages for military, racer, aerobatic, or civilian markings, or you can send Cajun's main man, Denny, your documentation, and he'll custom-make the markings for you in any size.

Scale Masters Graphics are printed using state-of-the-art technology that produces graphics with vivid colors and sharp detail. The markings don't yellow or crack with age. I have been flying models with Denny's graphics since 1995, and they look as good as the day I applied them (my airplanes are looking a bit haggard, though!). You can apply the graphics wet or dry; the vinyl material "breathes" to allow small air bubbles to escape. The graphics are nitro fuelproof to 30 percent and are completely unaffected by gasoline. The price range depends on the size and quantity; small 1/12-scale combat markings are available for $6.95, and large-scale sets range up to $100. If you want a great-looking model, ask Denny; he'll set you up! —*Gerry Yarrish*

Cajun RC Specialties (337) 269-5177; cajunrc.com.

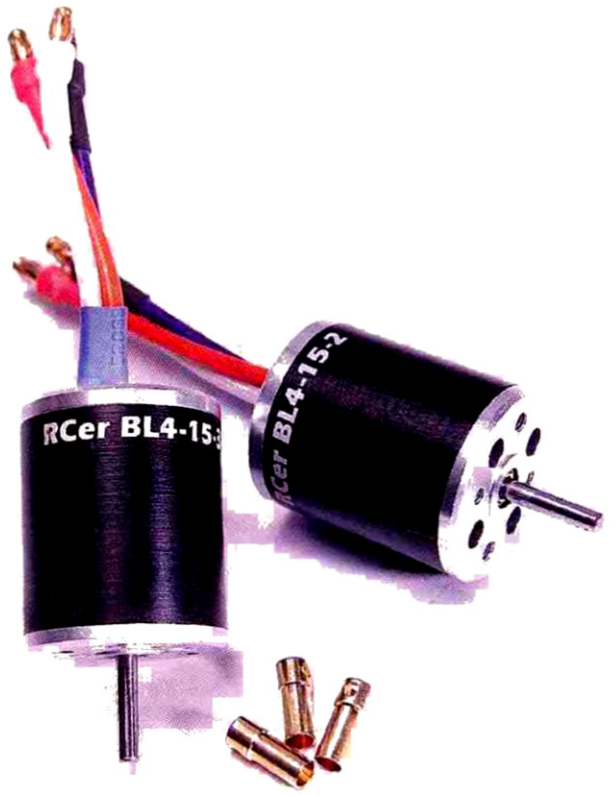


Keleo Creations
Strut Tubes
Strut your stuff

When you are building fairly large models (1.20 size and up), strength quickly becomes an issue. Parts such as clevises, engine mounts and landing gear are all available in sizes that are strong enough to do the job properly. But what about streamlined aluminum tubes? Used to support the wings on scale monoplanes such as Piper Cubs and Taylorcrafts, lift struts often have to be carved out of spruce or made out of music wire sandwiched between strips of wood to form a teardrop shape. K&S offers streamlined tubes in smaller sizes, but there has been nothing out there for the 1/4-scale guys until now.

Kelvin Cubbison of Keleo Creations—the guy who manufactures some of the greatest custom exhaust systems around—saw the need. He produced the tooling to make truly he-man-size strut tubes. He developed tubes in four sizes; the major (width) and minor (thickness) dimensions are: 15/16x5/8, 1x9/16, 5/8x3/8 and 3/8x1/4 inch. All have a stout, 0.035-inch wall thickness. The two smaller sizes cost $4.50 per foot, and the larger two cost $6 per foot. If you've ever tried to make your own wing struts, you'll love these new alternatives! —*Gerry Yarrish*

Keleo Creations (503) 359-5318; keleo-creations.com.



Empire RC
RCer Warp4 Brushless Motors
Power to spare

The Warp4 BL4-15 brushless motors offer the perfect Speed 300/480 upgrade for your tired brushed motors. Available in 2- to 6-turn configurations, these motors are the lightest (74.5 grams with wires and connectors) and also the shortest at 34.5mm.

With their high KV (rpm per volt) and when powered by a 3S lithium battery, the 2- and 3-turn motors are ideal candidates for electric ducted-fan jet models such as the HET Super Sniper and the F/A-18. For Speed 300 to Speed 480 direct-drive installations, the 4- to 6-turn motors are drop-in replacements, as the mounting holes on the face of the motor are spaced to accommodate both sizes of motor.

The Warp4 motors feature rugged construction and powerful magnets on their rotors. The rotors have a Kevlar sleeve to allow the motors to run at up to 40,00rpm. Both ends of the case and the can are made of machined aluminum, and both ends of the shaft are supported by ball bearings.

My test installation consisted of a tried-and-true Projeti that I power with a Mega 15/16/3 (3-turn) brushless motor, a Graupner 5.5x4.5 Cam Speed prop, a Jeti 30A ESC and a 7-cell, 1300mAh NiMH battery. This combination provides excellent speed (100mph!) and flight times of 6 to 8 minutes. I removed the Mega and replaced it with the Warp4 BL4-15-3 motor, and this took only a couple of minutes.

When I launched the Projeti, I could tell immediately that the model had a little extra punch—always a good thing. But the surprising part was the increase in flight duration—at least an extra minute. When Empire RC says that its RCer motors are the most efficient in their class, it isn't kidding.

I'm also in the process of testing a Warp4 2-turn in a 68mm EDF unit that Empire RC sells, and the results look promising. So far, on the test stand, the unit has produced 260 watts of power on a 3S2P Thunder Power Li-poly battery. By the way, the Warp4 BL4-15 series motors cost less than $74—quite a bargain, in my opinion.
—Rick Bell **Empire RC;** empirerc.com.

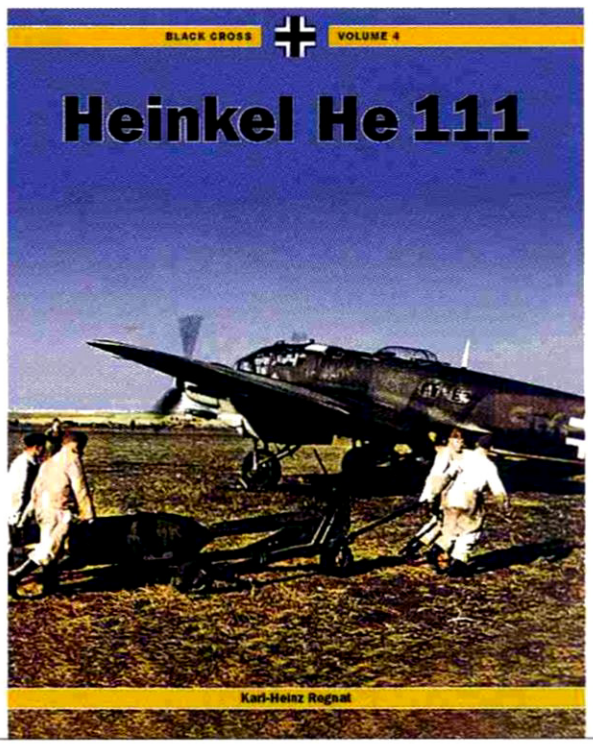
Specialty Press
Black Cross Volume 4: Heinkel He 111
Versatile warbird

Specialty Press has released a new book that is a perfect reference for any scale enthusiast. Volume 4 in the Black Cross series of books, "Heinkel He 111" provides thorough coverage of the plane that became a familiar sight during the dangerous period following the battle of Berlin. Author Karl-Heinz Regnat details the lifespan of this versatile aircraft in a softbound, 96-page book that includes 141 b&w photos, 50 drawings and three color plates of various paint schemes.

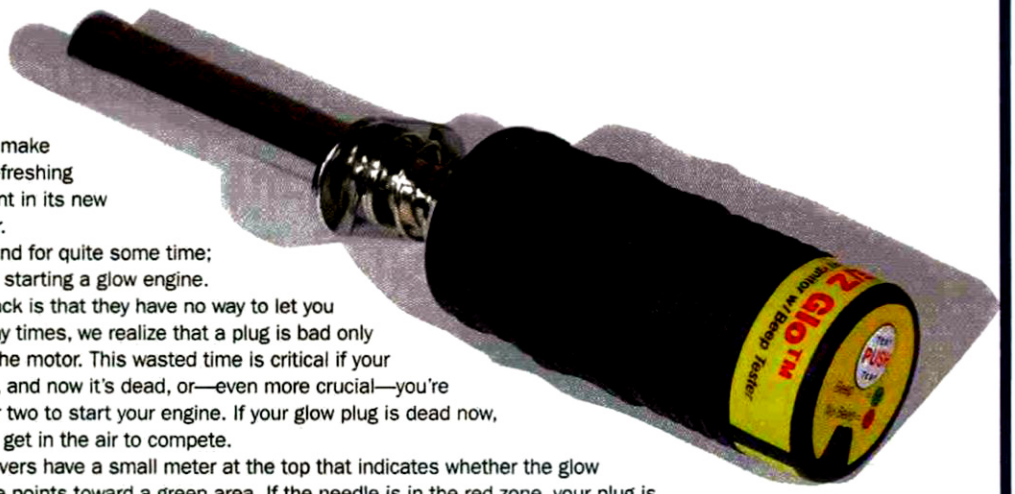
The first Heinkel He 111 was flown in 1935; in 1936, a civilian transport version went into service. This 10-passenger aircraft included a four-seat smokers' compartment directly behind the cockpit and a six-seat nonsmokers' compartment directly behind that. Used mainly as a passenger airliner for Lufthansa, the He 111 also served as a transport for German freight company RLM. The He 111 began service in the Luftwaffe in 1937. Throughout the course of WW II, the Heinkel He 111 performed a variety of roles. Though it was used primarily as a bomber, it also undertook reconnaissance, torpedo bombing, glider towing and transport roles. About 7,000 He 111s were produced in many variations.

The book's chapters deal with the development of the He 111, its commercial applications and the progress of its development from the A through the P series. One of my favorite chapters covers the plane's technical details. There are numerous drawings that show every aspect including detailed 3-views and cutaway drawings of every part. This is the perfect reference material for anyone who is thinking of creating a scale model of this adaptable aircraft. Another chapter discusses the He 111Z Zwilling (twin) and includes a nice 3-view of this five-engine, twin-body aircraft. Talk about a unique scale design for competition!

Overall, the Black Cross Volume 4 "Heinkel He 111" is an excellent addition to any scale-model enthusiast's library. Priced at only $24.95, this reference book is one that you will use repeatedly, and it could provide the details you need for your next winning scale aircraft. *—John Reid*
Specialty Press (800) 895-4585; specialtypress.com.



>Du-Bro
E/Z Glo
Little wonder



Du-Bro has long led the way with innovative products; it often finds unique solutions or products to help make modelers' lives a little easier. This refreshing approach to problem-solving is evident in its new product: the E/Z Glo glow-plug igniter.

Glow-plug igniters have been around for quite some time; they offer a reliable power source for starting a glow engine. Standard glow igniters' major drawback is that they have no way to let you know whether a plug is working. Many times, we realize that a plug is bad only after a few feeble attempts to start the motor. This wasted time is critical if your starter battery was low to begin with, and now it's dead, or—even more crucial—you're competing and have only a minute or two to start your engine. If your glow plug is dead now, there is no time left to change it and get in the air to compete.

The newer generations of glow drivers have a small meter at the top that indicates whether the glow plug is good when the meter's needle points toward a green area. If the needle is in the red zone, your plug is bad, but if the needle is somewhere in between ... well, who knows what that means? To remove this ambiguity from our lives, Du-Bro has invented the E/Z Glo. This new glow driver has a test button on top that you push to see whether your glow plug is in good condition to start the engine. When you push the test button, an audible beep emanates from the top of the E/Z Glo to indicate that your glow plug is in good condition and ready to start the engine. If there is no beep, then your glow plug is bad and needs to be replaced. This is pretty cut and dried; either your plug is good, or it isn't. You no longer have to wonder what borderline needle readings mean.

I have used the E/Z Glo at crowded fields with a wide variety of peripheral noise and have never had a problem hearing the beep. If you're at a competition where many planes are firing up at the same time around you, you might have a hard time hearing it, but a wise competitor will have checked his glow plug long before then.

The E/Z Glo is designed to give the average modeler years of trouble-free service. The handle is manufactured of durable plastic, and the plug clip is made out of heavy-duty metal. Of course, the battery can be charged only so many times before it wears out, but this doesn't mean that you have to buy a new glow igniter; just replace the internal Ni-Cd 1700mAh battery, and it willl be ready for many more years of service. The E/Z Glo igniter comes with the igniter body, battery and a wall charger. Priced at only $24.95, the E/Z Glo is a great value. —*John Reid*

<Winged Shadow Systems
Programmable RC Reporter
System monitor

Keeping an eye on your model's airborne radio system just got a lot easier with the RC Reporter multifunction system monitor from Winged Shadow Systems. The RC Reporter functions as a lost airplane locater (it plays a tune on command or if the signal is lost), a voltmeter, a voltage monitor and a radio-signal glitch counter, and it's programmable with a computer-interface adapter and a USB cable.

The programming system (sold separately) comes with all the hardware and a program CD to change and adjust the device's settings. You can optimize the beep frequency to make it easier to hear, adjust the device's turn-on position to match your transmitter, change the low-voltage warning threshold and even load different beep (ring-tone file) melodies into the unit to give your plane its own theme song. I particularly like the "Mission: Impossible" theme.

Installing the RC Reporter program on my PC took only seconds, and I quickly started playing with the device. Programming is easy with a pop-up screen window and its various slide bars and selection pages. Priced at $24.95, the RC Reporter is a great little gadget to add to your onboard flight system. With the available programming system ($24.95) and USB cable ($6.95), you can personalize the unit to make it your own. Try it; you'll like it!
—*Gerry Yarrish*

Winged Shadow Systems; rcreporter.com.

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PowerMaster Hobby Products (512) 285-9595; powermasterfuels.com.
Propwash Video (800) 355-7333; propwashvideo.com.
Quantum Models (877) 738-9270; quantummodels.com.
Quique's Aircraft Co.; somenzini.com.
R/C Direct (858) 277-4531; rc-direct.com.
RC Electronics (408) 705-1980; rc-car-planes.com.
R/C Showcase (301) 374-2197; rcshowcase.com.
RAm Radio Controlled Services (847) 740-8726; ramrcandramtrack.com.
RBC Kits; rbckits.com.
RC Superstore; rcsuperstore.com.
RCAT Systems (408) 292-9794; rcatsystems.com.
RCV Engines Ltd.; dist. by Wildcat Fuels.
ReadyToFlyFun.com (866) 472-8697.
Richmond RC Supply (877) 727-2329; richmondrc.com.
Robart Mfg. (630) 584-7616; robart.com.
RTL Fasteners (800) 239-6010; rtlfasteners.com.
Saito Engines; dist. by Horizon Hobby.
Scorpio; dist. by Hobby Lobby Intl.
Seagull Models; dist. by Horizon Hobby.
Sherline Products Inc. (800) 541-0735; sherline.com.
Sig Mfg. Co. Inc. (800) 247-5008; sigmfg.com.
SK Engines; dist. by Kangke USA.
SKS Video Productions (800) 988-6488; sksvideo.com.
Sky Hooks & Rigging (905) 257-2101; microrc.com.
Skyshark RC (866) 854-6100; skysharkrc.com.
Slimline Mfg. (480) 967-5053; slimlineproducts.com.
Smithy (800) 476-4849; smithy.com.
SoarSoft Software (810) 225-1165.
Solarbotics; solarbotics.com.
Sombra Labs Inc. (613) 863-4901.
Sonic-Tronics (215) 635-6520; sonictronic.com.
Southgate Aero; taurus-engines.com.
Sportsman Aviation; dist. by Global Hobby.
SR Batteries Inc. (631) 286-0079; srbatteries.com.
Starluck RC (864) 243-4011,starluckrc.com.
Sullivan Products (410) 732-3500; sullivanproducts.com.
Super Kraft; dist. by Kangke USA.
T&D Plan Sales; classicairplanemodels.com.
Tejera Microsystems Engrg. (TME) (813) 661-2649; tmenet.com.
Tekoa: The Center of Design (909) 763-0464.
Testor Corp. (800) TESTORS; testors.com.
The Ornithopter Zone (800) 445-4215; ornithopter.org.
The World Models Mfg. Co. Ltd.; dist. by AirBorne Models; theworldmodels.com; airborne-models.com.
Thunder Power Batteries; dist. by Hobby Lobby and Northeast Sailplane Products; thunderpower-batteries.com.
Thunder Tiger; dist. by Ace Hobby.
Tiger Shark; dist. by Kangke USA.
Top Flite; dist. by Great Planes; top-flite.com.
Tower Hobbies (800) 637-4989; towerhobbies.com.
Trick R/C (310) 301-1614; Zagi.com.
Tru-Turn Precision Model Products; dist. by Romco Mfg.; tru-turn.com.
U.S. Engines Products; dist. by Great Planes.
UltraCote; dist. by Horizon Hobby.
Ultrafly; dist. by Great Planes.
Uttam; uttam.freeservers.com.
Vanguard Vancouver; pacifier.com/~vvancou.
VMAR; dist. by Richmond RC.
Walbro (520) 877-3000; walbro.com.
WeMoTec; wemotec.com.
WES-Technik; wes-technik.de.
West Mountain Radio (203) 853-8080; westmountainradio.com.
Weston USA (508) 520-1170; westonusa.com.
Wide Canyon Engines (253) 653-9481; widecanyonengines.com.
Wildcat Fuels (859) 885-5619; wildcatfuel.com.
Wild Hare R/C (817) 430-0107; wildharerc.com.
Windsor Propeller Co. (916) 631-8385.
Wing Mfg. (309) 342-3009.
WRAM; wram.org.
W.S. Deans (714) 828-6494; wsdeans.com.
X-Treme Composite; dist. by Planes Plus.
YS Performance (775) 265-7523.
Zap (800) 538-3091; zapglue.com.
Zinger; dist. by J&Z Products; zingerpropeller.com.
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BY JOHN REID > PHOTOS BY JOHN REID

Altair UAV

RC AIRCRAFT FOR SCIENTIFIC RESEARCH

Above: the pilot and copilot operate the Altair from this console. Right: the Altair's electro-optical/infrared sensor is housed inside this dome.

SPECIFICATIONS

Wingspan: 86 ft.
Length: 36 ft.
Gross takeoff weight: 7,200 lb.
Max airspeed: 220+ knots
Altitude: 52,000 ft.

REMOTE-CONTROL AIRCRAFT ARE NOT JUST A HOBBY anymore; they can offer us protection and supply information, too. The National Oceanic and Atmospheric Administration (NOAA), in cooperation with NASA and General Atomics Aeronautical Systems Inc. (GA-ASI), is undertaking a series of atmospheric and oceanic research flights off the California coast using "Altair"—a high-altitude version of the Predator B, an unmanned aerial vehicle (UAV) specifically designed for scientific and commercial research missions that require endurance, reliability and an increased payload capacity.

The aircraft was built in partnership with NASA; it has an 86-foot wingspan, can fly up to 52,000 feet and can remain airborne for well over 30 hours. The Altair remotely piloted aircraft system will carry a payload of instruments to measure ocean color, atmospheric composition and temperature, and surface imaging.

A primary goal of the demonstration was to evaluate UAV performance for future scientific requirements relating to NOAA's oceanic and atmospheric research, climate research, marine-sanctuary mapping and enforcement and improved nautical charting and fisheries assessment.

Altair's 660-pound payload of sensors and other equipment will provide oceanic color-sensor images to improve fisheries management; ozone sensor measurements to determine ultraviolet levels; gas chromatograph measurements of the greenhouse gases associated with climate change, and a passive microwave vertical sounder to determine when flash-flood warnings must be issued. A digital camera system will facilitate shoreline and habitat mapping and ecosystem monitoring. An electro-optical/infrared sensor will provide non-intrusive, maritime surveillance for fisheries and marine sanctuaries.

Altair bridges the gap between earthbound and space observations and studies and will provide immediate feedback to scientists to help them better predict and respond to environmental changes. In the words of retired Navy Vice Adm. Conrad C. Lautenbacher, Ph.D., Undersecretary of Commerce for oceans and atmosphere and NOAA administrator: "UAVs have the potential to allow us to see weather before it happens, detect toxins before we breathe them and discover harmful and costly algal blooms before the fish do, and there is an urgency to more effectively address these issues.... While most Americans associate UAVs with national security, NOAA is working with partners to determine their role in the nation's environmental security as well." ✈